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LECTURE.

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ADMIRAL SIR FREDERICK W. E. NICOLSON, Bart., C.B., Vice-President, in the Chair.

ON THE LAWS AND CUSTOMS OF WAR AS LIMITING THE USE OF FIRE-SHIPS, EXPLOSION VESSELS, TORPEDOES, AND SUBMARINE MINES.

By Admiral the Right Honourable LORD DUNSANY.

I AM now about to give what, according to the laws and customs of this Institution, is called a "lecture" upon a particular point in the laws and customs of war. We are accustomed in this place to hear gentlemen fresh from the seat of war, or inventors of telephones, or Thorneycroft torpedoes, and we naturally listen to them with great attention, because we know they can tell us much more than we know ourselves. In my own case I have no such claim on your attention. I am not a great jurist, or any jurist at all. I am not a great writer on international law like "Historicus;" I would, therefore, prefer to discard the word "lecture" and call this paper an essay. I can only pretend to have thought out this subject to the best of my ability, and to have consulted, I hope with due diligence, the principal authorities on the subject, in doing which I have been under great obligations to the kindness of a friend I see opposite, who gave me facilities in the British Museum. I must further apologize to any learned jurist who may be present, and some distinguished jurists have been invited, for what may appear like depreciating their authority. To ignore the immense services rendered to mankind by the learned civilians, and especially such civilians as Lord Stowell, would only betray one's own ignorance; I simply deny that it is their province to make laws

for carrying on wars under new circumstances. To any Officers of the Torpedo Branch, some of the most promising and intelligent Officers of the Navy, I need scarcely say, if the slightest taint of dishonour attached to that branch they would not be found in it. At present, torpedoes are as lawful as any other means of warfare. There are those who contend that such means are not in the least objectionable on the score of humanity, that they will shorten war, or find some other compensation for their apparent mischief. It is also said with great force that on the introduction of shells, for instance, the same objections were raised on the score of humanity, and yet we have come to be perfectly reconciled to them. Regarding the principal authorities on the laws of war, I confess that a tolerably extensive research in the British Museum has not thrown much light on the matter; but torpedoes and submarine mines could no more find a place in the old jurists, such as Grotius and Vattel and others, than could rifle guns and breech-loaders find a place in Cæsar's Commentaries. The later jurists, again, have not yet had the facts before them upon which to build a theory. For it must be remembered that in the usages of war the practice precedes or makes the law, not the law the practice, and new cases make new laws. The latest instances of this, perhaps, arose out of the employment of balloons during the siege of Paris. During the siege of Paris some balloons were captured, and a knotty point arose as to what position the prisoners ought to be considered in. The French writers on the subject, those who have written, like Charles Heffter and others since the siege, consider that they were at worst nothing more than blockade-runners. The German authorities, on the other hand, considered that they came, in some degree, under the category of spies—in any case they sent them before a court-martial, and I understand it would have fared ill with some of them, including, I believe, a countryman of our own, if the war had not very opportunely for them come to a conclusion. It seems to me that there always has been upon certain points an unwritten law, a general consent of opinion, whether among our land or sea Officers which has governed their practice. This has been antecedent to, and independent of, the so-called "law of nations;" but it has grown into a tradition, and in time becomes public law. Such, for instance, is the old naval tradition that the crews of fire-ships are not entitled to quarter. That such was the universal opinion of the Navy in my boyhood I distinctly remember, and my own recollection concurs with that of many Flag Officers with whom I have consulted. I may add, in passing, that in 1809, the latest occasion on which we used fire-ships ourselves, in the Basque Roads, when the expedition was under consideration, the belief that the enemy would act on the principle of not giving quarter materially influenced the Admiralty. I shall, however, have more to say on the subject of fire-ships, the progenitors of our torpedoes, submarine mines, and other novel modes of warfare. I hope to show that the apparently cruel rule respecting fire-ships worked well for humanity in practice. Whether it should be extended to other cases, and if so, to what cases, is a serious matter for your consideration. I should state I consider if this essay has any value, it will rather be in its

suggestiveness and the opinions it may elicit, than in anything that is contained in it in the way of my own opinion.

But is some such rule necessary? Looking to the tendency—the increasing tendency—towards what would have been called "illegiti-" mate warfare," some may think it necessary or at least expedient. Let us then glance at what has been the progress of this tendency during the last century, and the point is not without interest, for the change that has taken place has been in a contrary direction to that we might have expected.

Going back more than a hundred years, in 1759, we find the Marechal de Conflans, who combined the dignities of Field-Marshal and Admiral, issuing an order against the use of hollow shot,—incendiary shell in this case. His words are remarkable. He says they were "not generally " used by polite nations, and that the French ought to fight according to " the laws of honour." We may pass over forty years to the battle of the Nile in 1798. It was, as we all know, a battle sternly fought out with round and grape, but by one of the thousand accidents in naval war the French flag-ship "L'Orient," a magnificent three-decker, took fire and blew up. Mutual animosity was at its height in those days, and the French thought they could not blacken the character of the victors better than by charging them with using incendiary missiles. This charge was untrue, but it expressed the feeling of the day. The English retorted that they found incendiary shells in one of the prizes. Passing over two instances in which we used fire-ships, as that is a topic to which I must return, let us examine a very remarkable incident that occurred in our war with the United States in 1812. It affords a very good gauge of opinion at that time, as a test of opinion in our own. The "Ramilies," 74, was lying off New London, at anchor, maintaining the blockade. She was short of provisions, and two American merchants, knowing this, fitted out a schooner and filled the hold with powder, covering it over in the hatchways with barrels of flour. An ingenious piece of clockwork attached to a gun lock, and a train leading to the powder, ensured its explosion at the hour it was set to. The vessel was captured as intended, the crew escaping to land. According to ordinary calculation and probability, the prize would have been ordered alongside the "Ramilies" to be cleared, and in that case when the clockwork reached the fatal hour, 2.30, a loud explosion would have ended the history of the "Ramilies" and her 600 men under Sir Thomas Hardy—Nelson's Hardy. As chance or Providence would have it, the schooner was ordered to anchor near another prize, but away from the "Ramilies;" and thus when the crisis arrived, there were no other victims than the prize crew. James, our standard naval historian, from whom I quote remarks, "We shall " not trust ourselves to comment upon this most atrocious proceeding;" and a naval Officer, a contemporary, Captain Brenton, says, "A quan-" tity of arsenic in the flour would have been so perfectly compatible " with the rest of the contrivance that we wonder it was not resorted " to. Should actions like this receive the sanction of Governments, " the science of war and the laws of nations will degenerate into the " barbarity of the Algerines, and pillage will take the place of kind-

" ness and humanity to our enemies." Such were the sentiments of two writers, one in military the other in civil life; and recurring to my own earliest recollections, I have no reason to doubt that they were the general sentiments of that day; perhaps they still maintain their hold upon the survivors of that generation. The young generation probably will view the matter in a different light. In any case, the incident as affording a test of two different schools of thought is interesting. If any young Officer of the Torpedo School is present, he may see little difference, in a moral point of view, as to how the explosion is brought about, and may think how much more surely it would have been effected in these days. Before quitting this incident, I am bound to say that it cannot fairly be held to reflect any blame on the Americans as a nation, who are as fond of fair fighting as ourselves in carrying on war.

Let us now pass from what we call the pre-torpedo period, when we were content with round shot, to our own more civilized days. The commencement of the period of more deadly weapons,—more sudden, secret, widespread destruction,—may, I think, be fixed in 1851–2. By a curious coincidence, or what in the phrase of the day would be called " the irony of history," two remarkable events signalized that date. The Napoleonic Empire, which had cost England 800,000,000*l.* to suppress, besides countless lives, and which all Europe had placed under a ban at the Treaty of Vienna, was revived and declared to be the " Empire of Peace." " L'Empire c'est la paix." At home, on the 1st of May in that year, we inaugurated the millennium of perpetual peace and universal brotherhood in Hyde Park. The doors of the temple of Janus were closed, and those of the big temple of peace and commerce were opened. War was declared out of date. As every department of human industry was invited to that exhibition, I believe that some benighted persons like Armstrong and Whitworth and Lancaster sent specimens of their wares. Report said they were rejected, and the inventors told to take their obsolete toys to Fiji or the Cannibal Islands. I never heard that they did so, and perhaps it was as well that they did not. Well, two years passed, and then " a " change came o'er the spirit of our dream." The new French Empire was established at the end of 1851, and Napoleon III had his hands full for the next twelve months. In 1853, however, his hands were idle, he had leisure to look abroad, and, as the pretty little nursery hymn tells us,

> " Satan finds some mischief still
> For idle hands to do,"

it must have given zest to the author of mischief that it originated in the holy places, for you may read in Kinglake it was a squabble about the keys of the holy places between the Greeks patronised by Russia, and the Latins patronised by France, that really orginated the Crimean War. Screw line-of-battle ships were among the first fruits of revived Napoleonism, and the Crimean War gave rise to the first ironclads—another idea of the Napoleon of peace. Ironclads being then apparently invulnerable, set people thinking of means to destroy them. For some time the contest was between iron plates and

guns, the guns growing larger and larger until Italy now possesses a gun that will throw a ton of iron some nine miles, nor is that likely to remain the maximum of artillery power. It is stated in the *Edinburgh Review* for October, "The great gun now in contemplation "in Italy, in consequence of the experiments made at Spezzia, is to "weigh 200 tons. The length of this enormous weapon will be "50 feet; the length of the bore, 44 feet; the diameter of the bore, "21 inches. The charge of powder will weigh 950 pounds; and the "projectile, five feet in length, will weigh 6,000 pounds. This gun is "calculated to be able to throw its shot for twelve miles, or as far as "from Woolwich to the West-end." They have not yet reached a range that will cross the "silver streak," but even that does not seem quite impossible.

The history of our own torpedo schools is short, for we have had no experience of them except in the way of experiment. Some of those present must have heard Mr. Thorneycroft's lecture[1] on his torpedo vessel, and may remember the French experiment upon the old frigate "Bayonnaise" He could not have described the mischief done in more graphic language than he used by saying the breach made would admit an average omnibus. I believe one of our own experiments gave an even yet greater result; a breach 40 feet by 20 feet, that is to say, a hole that would admit four omnibuses abreast. I am not sure whether this breach was effected by a torpedo, properly so called, or by a submarine mine, for our school distinguishes the two, which the Americans do not. To the unscientific mind such a breach would appear very conclusive, but our naval architects I believe think the system of watertight compartments might save the ship. Yet one fancies a ship, with say 20 feet of keel blown away, would be like a man with some inches of his backbone extracted, rather limp and helpless.

The use of a torpedo, as discharged by one ship against another, does not seem to me any departure from open warfare. Submarine mines, on the contrary, have, or may have, in some circumstances a different character. We are, let us suppose, at war with France, and she, fearing an attack on Cherbourg, strews the approaches thickly with submarine mines; who questions the legitimacy of that act? Again, three or four Thorneycrofts steal into an English anchorage or narrow channel by night and perform the same operation—has it the same unexceptionable character? We must remember that practically the operator runs little personal risk unless you put him under the same rule as crews of fire-ships. The Thorneycroft torpedo-boat seems the complement, if I may say so, of torpedo submarine science. Mr. Thorneycroft told us that a yacht he built for Baroness Rothschild steamed 21 knots. He said further that he was prepared to build boats to maintain a speed of 25 knots, and the *Times* told us lately of one of them actually steaming 27 knots on the Thames. Has science spoken its last word in this branch? There is no reason to think so. Let us then suppose for facility of calculation three knots more gained, that is 30 knots per hour, one mile in two minutes. At anything above a mile—

[1] See Journal of the Institution, vol. xxi, No. 91, page 611, *et seq.*

1,760 yards—bow on, such a boat would present too small a mark to hit. Say the first shot is fired at one mile, in less than one minute, and before the smoke of the first gun has cleared away, the Thorneycroft is within torpedo range and launches her two torpedoes. We had the result the other day in the last exploit of the Russian steamer yacht "Constantine," as given in the *Times*. The "Constantine," cruising in the Black Sea, observed the look-out ship of the Turkish squadron, an ironclad, and detached a torpedo cutter against her. The cutter discharged two torpedoes, and the Turkish ironclad disappeared, leaving nothing but fragments on the surface of the water. The narrative says it was impossible to save the crew. I do not know whether they took the trouble to try. It must be remembered, however, that torpedo boats cannot pick up the crew of an ironclad if they care to do so, but an ironclad can save the crew of her pigmy foe. But a point I would call your attention to is the very small risk to the torpedo crew at which this wholesale destruction is effected. The huge guns of the present day make excellent practice, as I witnessed many days last summer; but they fire very slowly, and, so far as I could judge, the chances of hitting a torpedo-boat in motion would be *nil*.

In the case of submarine mines their use is of course confined to shoal waters. They may be either automatic (a ship touching them causing their explosion), or the operator may be miles away in electric communication. There also the operator might be in perfect security. In one experiment I saw of the kind, the submarine mine was intended to blow up a raft, which it did most effectually, sending a shower of small fragments up into the sky. But the explosion was effected not by one of the artillerymen, but by a fair lady standing by my side, who just touched with her thumb a little spring and did the work. She was in perfect safety. I do not mean to argue that she ought to have been hanged. But with regard to torpedo-warfare a remark made by a very intelligent Officer of the department struck me forcibly. In reply to some observation of mine, after witnessing some very successful experiments, he said, "We consider the art in its infancy only, but "believe it to be capable of great development." If this infant Hercules can kick a hole 800 square feet in a ship's bottom, what will he do full grown? A variety of this warfare seems to have been practised by the Confederates, which would certainly be more honoured in the breach than in the observance. That also we find detailed in the *Edinburgh Review*. I call your attention to it because it certainly seems to be on the verge of the lawful, if it is not beyond it. The particular means of exposion consisted of a hollow lump of iron, filled with a charge of dynamite. It was rubbed over with coal tar and dust, and exactly resembled a large lump of coal. I am not sure whether it was used with success, but it certainly was used by the Confederates. Every one here present probably remembers a case of a criminal attempt of the kind made by a German at Hamburg, who, wishing to obtain the insurance money for a vessel, made provision for putting a coal of this kind into a ship, knowing that whenever it was thrown into the furnace an explosion would take place, and the ship would be destroyed.

A most important development of torpedo science, which attracts little notice (probably because the experiments are conducted in secret), is likely to take a foremost place in the next war. I mean such submarine vessels as David Busnell or Robert Fulton devised eighty years ago, and were successfully used by the Confederates in the American Civil War. Those who wish to inform themselves upon the subject will find ample details in Lieutenant-Commander Barnes's work, and in Renard's "Fond de la Mer." Elsewhere Barnes tells us that the "David" submarine boat, which destroyed the United States ship "Housatonic," was manned by a crew of nine men, eight of whom worked the propeller by hand, the ninth steered the boat and regulated her movements under water. She could be submerged at pleasure to any depth, or could be propelled on the surface. In smooth water she could be exactly controlled, as her speed was about four knots.

In Renard's "Fond de la Mer" we hear that Spain in 1862 built a submarine vessel called the "Ictineo," which was perfectly successful in submarine navigation. Her peculiarity was an apparatus for renewing the oxygen when exhausted. She worked as well at a depth of nine fathoms as at the surface, and remained five hours under water. The French submarine ship "Plongeur" was worked by compressed air, and was "completely successful except as to "stability." The purpose of these vessels is to use torpedoes unobserved.

The humanity of the present day then has provided these wholesale ways of shortening human sorrows. You may be sent to the bottom by a torpedo, or blown to the sky by a submarine mine. Has it done no more? Wheaton, the American jurist, informs us that "it seems "to be thought that a steam vessel *on the defensive* may throw steam "or boiling water." The assertion is not in a very positive tone, and is confined to the defensive.

May ships on the offensive boil their enemies alive?

We seem here to have got pretty far in the way of what used to be thought illegitimate warfare. Has science done no more?

"Beneath the lower depth a lower depth appears."

In the *Nautical Magazine* for last month I found, among patents for inventions, "No. 4355. Carl Böhm, improvements in apparatus for "discharging petroleum, or other hydro-carbon fluids from torpedo "boats, or other vessels." Discharging liquid fire that is.

The patent is for "improvements," so the invention is not new. Some very illiberal lines on Sir W. Congreve, the inventor of Congreve rockets, after his death ran,

"At his old vocation the worthy knight
Had laboured long and well,
And perfected his instruments
In the crucibles of ——"

a very hot place. Mr. Carl Böhm might learn something there of the merits of hydro-carbon. We need not go further in following the march of civilisation. Have we not got near the limits which the laws and customs of war impose?

A few words on fire-ships, an invention for which the present age is not responsible.

It was a savage mode of warfare, but limited by a conventional custom. As it was said of the Russian Empire some years ago, that it was a despotism tempered by assassination, so it may be said of the use of fire-ships, that it was a cruel practice, but tempered by hanging their crews, if caught. I need not trace back the origin of fire-ships, like old Falkiner, who tells us they were used by the Rhodians 190 B.C., and it would be hard to prove they were not. Certainly they were used by the Greeks, with their famous Greek fire. It is more to the purpose that they first appear in our Navy List in 1675.

About this time, in a list of ships in commission, given in an old book, "Sea Laws," in this Institution, there is an abstract of our sea-going ships on December 18, 1668, giving first and second rates, none; third and fourth, 46; fifth rate, 2; bomber, 1; and fire-ships, 26.

Old Pepys tells us, with reference to our preparations for war with the Dutch in 1686:—"'Tis a little odd to see almost half as many fire-
" ships as men-of-war in this fleet."

The fire-ships proved effective in the Dutch and French wars at the close of that century, but seem to have gradually fallen into disuse in the 18th. Still we find the expedition under Hawke and General Sir John Mordaunt against Rochefort, 1757, attended by two fire-ships; that of Boscawen's, two years later, also. In 1779, Lord Howe's fleet in North America, we read, was strengthened by two fire-ships; and lastly, when the French and Spaniards swept the Channel with 80 sail-of-the-line in 1780, they had nine fire-ships, and Sir Charles Hardy, who could only watch them with 40 sail, had four fire-ships.

When the Revolutionary War broke out at the end of last century, neither side seems to have used fire-ships as part of a fleet; but in 1804, after the short Peace of Amiens, when Napoleon collected an army and flotilla at Boulogne, threatening invasion, Nelson used explosion ships, called catamarans, against them, with no effect.

Thus it is undeniable, on the one hand, that both England and France employed fire-ships without scruple up to this time, and it is no less undeniable that the crews of fire-ships were not considered to be entitled to quarter. This may seem to be *illogical*, yet one can understand it. In the first place, from the nature of the case, these crews could not stick to their ship to the moment of explosion, but had, after firing the fuse, to make their escape in boats. These boats, as they passed through the enemy's lines, would naturally become targets; and if, meanwhile, some ship, clasped in the deadly embrace of the fire-ship, had exploded, it is all the more likely that the fugitives should be the objects of unsparing vengeance. Probably, too, the vague but fatal epithet of "un-English" came to attach to men who used a deadly weapon, but withdrew themselves (sometimes too quickly) from the fray. I cannot produce evidence of the facts, but I believe that Officers serving in fire-ships did not stand high with their brother Officers. It is some confirmation of this creed, that we do not find the Boscawens, Rodneys, Howes, Jervises, Nelsons, serving in fire-ships.

Of course, the idea of being hanged like a criminal would have its effects; and then, on the last occasion of our using fire-ships in the ill-managed expedition in Basque Roads, Lord Dundonald tells us that, of 20 fire-ships employed on that occasion, 4 only reached the enemy's positions *at all*, and *not one took effect!* Why not, when a squadron of line-of-battle ships is easily visible, even at night? Evidently because the crews quitted their ships too soon. But why did they do so? Were the veterans of that day afraid to approach an enemy even in the darkness? The official correspondence given by Lord Dundonald establishes the fact, that with the French, as well as with ourselves, the crews of fire-ships did not expect quarter. That fact was admitted, even by Lord Dundonald, to be a strong reason against the proposed operations which Admiral Gambier, in his letter to the Admiralty, *deprecates* as being a "horrible mode of "warfare." Writing to Lord Mulgrave, First Lord of the Admiralty, he says:—"The enemy's ships lie much exposed to the opera-"tion of fire-ships. It is a *horrible* mode of warfare, and the attempt "hazardous, if not desperate." It may be said that Gambier was a man likely to take a weak and unmilitary view of such matters. But then Lord Cochrane was the very reverse—a perfect fire-eater—what says he? He tells us, Vol. I, page 303:—"*Other* Officers had "been consulted, who disapproved of the use of fire-ships." And further on:—"My reply to Lord Mulgrave, therefore, was, that the "opinion of Lord Gambier, and of the naval Officers consulted by the "Admiralty, *as to the use of fire-ships*, coincided with my own; for if "any such attempts were made upon the squadron, the result would in "all probability be, that the fire-ships would be boarded by the "numerous row-boats on guard, *the crews murdered*, and the fire-ship "turned in a harmless direction." By "murdered," Lord Dundonald means put to the sword according to the usual practice. Elsewhere we find (page 362) that Lord Gambier had denounced the operation as a "horrible and anti-Christian mode of warfare."

The expedition was, as all know, a failure, though the whole French squadron ought to have been destroyed; the main cause of failure seems to have been the hurry of the fire-ships' crews to quit their vessels, presumably from a dislike to be slaughtered.

The inference I draw from this is—first, that such a rule, the rule of giving no quarter to the crews of fire-ships, worked well in practice; secondly, that it might be applied to some other cases, without really incurring the charge of barbarity.

But some may say, "What, not barbarous to kill prisoners in cold "blood?"

In the case just cited, I find nothing of such killing in cold blood, for the fire-ship crews seem to have taken very good care of themselves; whereas, had they taken their ships close to the enemy, there would probably have been a slaughter, that is, a burning alive of several thousand.

Of course, it is our object in war to destroy our enemy; but Lord Dundonald, a most competent authority, tells us this could and would have been done after the failure of the fire-ships, but for the peculiar

character of Gambier and the unhappy jealousies of the British fleet.

It would of course be a very serious thing now, in the 28th year of the millennium, to practise severity to prisoners, even by refusing quarter. But is that really cruel which saves life, or, at worst, kills units to save thousands. How do you treat spies? and why do you do so?

For it is not in either case an act of revenge, it is done on the principle that against exceptional means of attack you must use exceptional means of defence, and that both reason and experience tell you that those means will be successful.

Take this illustration. The Captain of the "Excellent" desires to try some new infernal machine against a target hulk. It requires the nicest adjustment; and, calling the carpenter, he says, "Mr. Chips, "you will go in that boat, taking this machine with you, and you will "fix it in such a manner." Well, Mr. Chips fixes it to a hair's breadth. But would he have done it equally well had the Captain added, "But take care how you use your tools, for if you are heard, you are "hanged?"

"Horrible suggestion!" some may say, and quite contrary to laws of war, quite indefensible, morally and logically.

Well, I will put the logical argument against it in the form our French friends are so fond of. "Of two things, one. Either such "weapons are legitimate, and then you cannot punish those who em- "ploy them, or they are *illegitimate*, and you should not use them "yourself." Now this is a very pretty dilemma with a very sharp pair of horns; and I am asked, "Which will you choose?" I might answer, "Neither! Your new mode of warfare may be legitimate; what is "more, I must practise it if *you* do; but I object to it, and the higher "law of self-preservation compels me to treat the practice with "severity."

Of course, to put herself right, England would have to offer to relinquish the practice, if the other Powers would do the same. But this they would refuse, because they took to the new weapons to destroy our maritime supremacy. As regards some supposed prohibition of such severity by the law of nations, where do we find it? Or, to go deeper, *is* there any *fixed* "law of nations" as applicable to a state of warfare?

In the same sense that we talk of the laws of England or of any other country there is no law of nations. Roughly speaking, we attach to the word laws three necessary conditions. Some recognised source to enact them; some authorised court to decide upon alleged infractions; and, above all, some power to enforce those decisions. All these three conditions are wanting to the law of nations. Failing this last requisite the others are useless, and it is just there, that what is called international law breaks down in war-time, when *inter arma silent leges*. We might see an illustration of this weakness in Canning's amusing lines on the Revolutionary French Consul put to death by the Dey of Algiers.

We are told that:—

"The Consul quoted Bynkershoek,
And Puffendorff, and Grotius,
And proved from Vattel
Exceedingly well,
That to do so would be quite atrocious.
'Twould have set a Christian weeping
To have heard the doubts he stated.
But the Moors did as they were bid,
And strangled him while he prated."

Here all his learning could not save him, because it wanted what the jurists call a "sanction," a power to enforce it. He had the powder but not the shot.

The Dey, of course, was a barbarian, and knew no law save his own will, but, in a civilised way, strong Powers imitate him in the present day.

A French witty infidel of the last century said that "Providence "always sided with the big battalions." Our own history affords many glorious exceptions. But, had Voltaire said that international law in war-time was always interpreted in favour of the big battalions, he would have come near the mark, and I don't see how it can be otherwise.

The great "Publicists," or writers on international law, are self-commissioned. They differ as to their own origin and office; they differ about fundamental principles, and differ on plain questions of morality where mankind are generally agreed. Some of the old jurists of the highest authority justify assassination and poisoning. Wheaton, a standard American authority, tells us:—"Even such "institutionary writers as Bynkershoek or Wolf, who lived in the "most learned and not the least civilised countries of Europe, at the "commencement of the 18th century, assert the broad principle "that everything done against an enemy is lawful that he may be "destroyed though unarmed and helpless, that fraud or even poison "may be employed against him, and that an unlimited right is acquired "by the victor to his person and property. Such, however," he goes on to say, "was not the sentiment and practice of enlightened "Europe at the time they wrote, since Grotius had long before in-"culcated a more humane principle."

But, hear what Grotius, this same Grotius (whose real name De Quincey tells us was Van Groot), tells us Puffendorf says:—"It may, "in the next place, be particularly enquired whether it be lawful to "assassinate an enemy? And here Grotius or Van Groot thinks "that there ought to be a distinction made between persons who "violate their faith expressly or tacitly given, as soldiers, subjects, "vassals, refugees, or persons that were never bound by faith, and "that to employ the latter is *what no law forbids*. But to make use of "those, who, by the act must be guilty of falsehood or treason, is "what the more civilised part of mankind always look upon as the "greatest infamy or baseness"!!!

So it would seem that to employ the Heathen Chinee, the Malay Pirate, or a maniac to assassinate your enemy's General is quite justifiable. To adopt the style of a well-known preacher, "Oh, Van

" Groot, Van Groot, who taught you this vile morality ?" Puffendorff does not concur in this. But *Vattel* allows assassination.

Coming to modern writers on international law, though in my researches for some definite rules as to what is legitimate in warfare or what is not I was disappointed, I found some very puerile prohibitions and some which showed ignorance of the subject.

John Heffler, writing in 1873, "Le Droit International," page 241, says:—"The laws of humanity forbid, also, using means of destruc-" tion which, at a single blow by mechanical means, beat down whole " masses, reducing man to the *rôle* of an inert being, or uselessly in-" creasing bloodshed. Let us cite the use of star shot (*boulets rainés*) " in land battles, or '*couronnes foudroyantes*' in naval battles, pro-" jectiles which destroy whole ships with their crash."

Telübad, in "Droit des Gens de l'Europe Moderne," objects to chain and bar shot, and says it is also forbidden to load muskets with two balls!

But the fact is, we must not look to the jurists for anything more than general principles in the laws of war. It is not their function to make or to mend those laws. They are often made for the occasion by the Commanders on the stronger side.

Thus, our countryman, Montague Bernard, says in a very remarkable passage:—"The student of history is apt to be a little puzzled by " frequent reference to '*laws*' with which he is tacitly assumed to be " familiar. The Duke of Wellington directs that a French garrison " shall be decimated and all the Officers put to the sword if it should " *violate* the '*laws of war*,' by destroying works which it cannot " maintain. The laws of war forbid the defence of an unfortified " town. They permit a ship to hoist false colours at sea though not " to fire under them; they do not prohibit bribery or intrigue. What " are these laws? Where are they written? What authority do they " command? They are a body of *usages*, for the most part con-" ditional, which have arisen principally from motives of convenience " or the extension of commerce."

I am bound to say here, that the distinguished writer of this passage informs me that he by no means meant to refer to this order as a precedent or authority. But we have the fact that the Duke gave the order to a Spanish Officer, who was at a distance, and who would have felt no compunction in executing it.

Napier, indeed, doubts whether the threat would have been acted on, and thinks it *ought* not as regards at least the private soldiers who were irresponsible, but that supposing escape impossible, the Officers might have been executed. Were not the inferior Officers, however, as irresponsible as the soldier? Modern jurists, I believe, deny the right of refusal threatened.

The Duke of Wellington was a man who knew his own mind, and if ever he wrote a letter free from a shadow of vacillation, it was that stern command to inflict the punishment *without awaiting any further orders*.

Are we then to admit that the Duke, on so momentous an occasion, while invoking the laws of war, not only violated them himself, but

outraged the precepts of humanity? I cannot admit it! I believe the explanation to be simple.

It was a *Spanish* force, commanded by a Spanish Officer, that blockaded Pampeluna, and the French garrison had obtained possession, by the basest military treachery, in *peace-time*, and in violation of all law and principle. It was as clear an act of brigandage as the seizure of Dover Castle this day, by French soldiers disguised as "excursionists," could be. The Spaniards, therefore, had a right, in any case, to treat the garrisons as pirates, but this right became doubly strong under the circumstances contemplated in the Duke's letters. (See Wellington Dispatches, Vol. XI, p. 210.)

But why do I dwell upon this episode? Because it seems to show that acts of war are best judged by the Commanders who have the facts before them, and that even in this extreme case, apparent severity was not real inhumanity. I believe that stern letter not only saved lives on that occasion, but that the lesson was probably remembered in 1870, and may have saved lives then.

But it is vain to think that the rough game of war ever was or ever will be played in exact conformity with the rules of the jurists. The war of 1870 produced many infractions of the law of nations, if we may believe M. Calvo. He cites several, which time will not allow me to quote. The French, as the weaker party, complained, but in every case the Court of Big Battalions decided against them, and what was worse, when that Court sent in its little bill, it proved to be just five thousand millions of francs!

Think what a torpedo of a bill! How many six-and-eight-pences must have gone to make it up?

To remedy the many defects of international law, a Conference met at Brussels in 1874, when we are told that Prince Gortchakoff sent a programme of seventy-one Articles, *covering the whole ground* of the usages of war, in itself forming, as Prince Gortchakoff said, only a starting point for ulterior deliberation. It soon appeared, however, to the British Commissioner, to be a Conference in which the wolves offered little more to the lambs than a voice in preparing the mint-sauce with which they were to be eaten.

Æsop would have described this Conference in some terms like this:—"The wolves of a great northern forest invited the sheep of "neighbouring pastures to a Conference, upon the most humane "method of carrying on war. The chief Commissioner, a venerable "wolf, having dwelt on the pacific temper and humanity of the "wolves, deploring the sad necessities which at times forced them "into war, stated his complaint against the sheep.

"Instead of adopting any recognised military formation on the "approach of the wolves, the sheep, he said, rushed together in a "tumultuous manner, forming what was neither line nor square, but "a shapeless crowd, faces inwards and sterns outwards, which (to "say nothing of its unbecoming or unmilitary effect) made it impos-"sible for the wolves to select the fattest sheep or the tenderest "lambs, as was their undoubted right, and, what grieved their hearts, "made it necessary to be rough with scraggy or elderly ewes.

"To this the spokesman of the sheep, an elderly bell wether, "replied, that for his Excellency's kind intentions the sheep were "much obliged, and to his assurances of wolfish humanity, they could "only answer 'bah.' That the sheep were a simple folk, knowing "little of war, and having, in truth, only two recognised manœuvres. "The 'strategic movement to the rear' (always executed in double-"quick time) and the formation of which his Excellency complained. "'Faces inwards, sterns outwards,' that it was not, he believed, a "manœuvre recognised at head-quarters, either in St. Petersburgh or "Berlin, nor was it practised by the British Guards on parade. But "it suited the ovine genius, because those in the centre of the "formation were safe, and those outside could not see the danger, "which agreed with the ovine constitution.

"That for the rest he must only say 'bah!'"

We cannot then look to a Conference to decide.

It will, I imagine, fall to our Admirals and Commanders in the next war to decide this question. When they come to do so I hope it will be unbiassed by any mere phrase. Bismarck said "The French "were at all times under the dominion of four phrases," and we at times fall under a similar yoke. I object, in a matter of this kind, to the phrase "murdering prisoners in cold blood." It is begging the whole question to call it murder, for we are all agreed that murder is an objectionable practice, and it is inaccurate in every word. An enemy is not a "prisoner" unless you make him so, and the expression "cold blood" is utterly inapplicable to the circumstances assumed.

For how would the case arise in actual practice? We will assume that a submarine torpedo-boat has just succeeded in blowing up a ship and her 600 souls in sight of our fleet. Those who have just witnessed the catastrophe, and know that it involved the death of many fast friends, will hardly be in that frame of mind called "cold-"blooded." Well, every eye is on the stretch to discover the doers of that deed, and the submarine boat—crippled by such an accident as constitutes the only danger—emerges on the surface. The fire of every ship concentrates upon that boat, the guns' crews not in the coldest mood. Shall the order to "cease firing" be given, and shall those who have just sent 600 brave souls to a watery grave be sent back to reap their rich reward, and encourage others to emulate the deed? That is the question as it would present itself. I see no murder and no cold blood, but a stern law of retribution, older than any jurist's theory. I believe that law to be just, I know it to be for the welfare of England, and the Poet tells us—

"Britons rarely swerve
From law however stern that tends their strength to nerve."

Major E. H. Cameron, R.A.: Such a subtle and delicate vein of satire has pervaded Lord Dunsany's discourse that I really do not know at this moment whether he is in favour of or against the use of torpedoes and other such implements of warfare. He, certainly, it did seem to me, at one period of his lecture, glanced rather strikingly at those who discharge torpedoes, as doing so from a position of perfect safety. Instead of that being the case, I think I may say that anybody engaged in torpedo service may go forth very well assured that he is going on a service of the

most extreme danger, if not on an absolutely forlorn hope. The noble lecturer instanced the "David," and I thank him for that instance; for if my memory serves me right, the crew of the "David" went to the bottom together with the last ship which she destroyed, and they sleep the sleep of brave men who died in the defence of their country. He has also instanced explosive coal lumps, and, I think, gives the credit of that, or the discredit, to the Confederates. I can only say I have had one of those lumps in my own hands which came from the Northern side, and was intended by Northern cruisers to have been put on board blockade runners who were to have been allowed to proceed on their mission, to discharge their cargo into the bunkers of Confederate cruisers, and thus the explosive coal lump was to have produced its unhappy result when least expected. Then the noble lecturer said something about modern barbarity and the barbarity introduced by science; but how about molten lead poured from machicoulis upon the heads of the knights of old; and not only upon the knights protected by their tin pots, but on the unarmoured yeomen who came to storm the castle! With your permission I would quote something from a lecture delivered in this Institution by Major Fosberry, on a kindred subject: "Have we not heard that in the dark ages humanity beat out "men's brains with a mace, whilst cruelty used the lance, the sword, or the arrow, "and that the bishops of the period therefore rode into action with the mace, so as "to kill without shedding blood?" That was the nice distinction drawn in the dark ages. Then, Sir, the noble lecturer said, "What will be said as to "torpedoing English channels or harbours by the enemy during the night?" Well, I suppose we must, as the Americans say, sleep with our "eyes skinned," and no doubt it is the early bird that gets the worm; and if the enemy gets in, he can torpedo the harbour with perfect safety if he is not found out. Some years ago, in deference to the wishes of a foreign Power, whom, perhaps, now we are not so anxious to conciliate, we abandoned the use of explosive bullets; and now, mark the irony of history. True, we have abandoned them, and with them the possibility of blowing up our enemies limbers with great certainty. But what have we introduced instead? We have the Armstrong segment shell which, I venture to say, produces a far worse wound, and which is now happily dropping into disuse, and we have the Martini-Henry rifle which produces an equally severe wound, which is now happily in full vogue. Fire-ships, I think, must be dismissed from consideration as our ships of war are, from the outside, practically uninflammable. In conclusion, I would say, "Save us from the cruel "mercies of the weak." War—that splendid mistress for whose favours we have all longed since we reached man's estate—must be given her full attributes and painted in her most deadly colours, in order that the curses which, undoubtedly, she brings to the majority of the population may extend over as short a period as possible. Let us make her as deadly as we can in the name of humanity and of every good feeling.

Mr. C. Böhm: I have listened with great interest to the noble lecturer's instructive words, and I hope that we shall all be benefited hereafter by what he has said. His Lordship, however, referred to me in the course of his lecture as the inventor of the Greek-fire torpedo boats; and being anxious that no stigma or imputation should rest on my character, and on that of those who have been associated with me in establishing the manufacture of Greek-fire torpedo boats in this country, I mean Messrs. Wigzell, Halsey, and Co., I ask your permission to read a few passages from a pamphlet which we have published on this subject: "And to our critics generally, who may "be inclined to argue that our Greek-fire apparatus cannot be regarded as a 'fair' "weapon, we say, You manufacture and employ guns capable of throwing from "a safe distance of 4,000 to 5,000 yards shells weighing several hundredweight filled "with still more inflammable and destructive compounds than petroleum, and yet "you wish the world to believe that the ships armed with our Greek-fire apparatus "take you unfairly at a disadvantage; whereas, in point of fact, if anything, it is "you who are making use of unfair weapons, for our apparatus is perfectly in-"offensive at a distance of two or three hundred yards, and therefore those crews "who are using our machine must exhibit more martial, heroic, and self-sacrificing "qualities than your crews, who are armed with guns capable of smashing to atoms "from a safe distance of 4,000 to 5,000 yards our apparatus and the crews in

"attendance on it." I am not an Englishman by birth, but I have lived here for many years; and to all intents and purposes I am an Englishman. This pamphlet was written by me, and is endorsed by Messrs. Wigzell, Halsey, and Co., and as the words I put into their mouths express also my feelings, I crave the liberty to give you the concluding sentences of our pamphlet: "We repeat it with emphasis, on patriotic "grounds, and for the sake of our brave and heroic 'tars,' whom we do not wish to "see paralysed in their gallant naval combats just at the moment when victory is "within their grasp, that we shall be glad if a few days after the publication of this "pamphlet adequate and proper antidotes be discovered and adopted into the service "by our naval authorities, and we can only add that our pleasure will be increased "if they keep the secret of such antidotes to themselves. It is, however, generally "known, that great scientific and inventive minds have unsuccessfully endeavoured "for many years, since the Abergele railway accident, the conflagrations at "Bordeaux, Antwerp, &c., &c., to discover efficient antidotes against the disastrous "effect of burning crude petroleum, when spread over a large area. Of course, we "and the readers of our pamphlet are perfectly well acquainted with the capacities "of the smothering process, and of the various patented and unpatented fire-"extinguishing compounds, but as we know also that their application is impossible, "impracticable, and useless when the deck and sides of the ship become suddenly "covered with a sheet of fierce and vehement fire and flame within a few seconds, "we make an earnest appeal to the authorities, and to the inventive and scientific "genius of our countrymen to seek for practical antidotes, though it does not require "much imagination to conclude that the discovery of an antidote, which would be "suitable and practicable under the conditions which must be anticipated in actual "warfare, would be accompanied also by a heavy pecuniary loss to our firm, but we "say with deliberation,—perish the money interests of our firm if only British "supremacy be maintained over the seas of the world."

Admiral VESEY HAMILTON: I have listened with the very greatest pleasure to the lecture delivered by Lord Dunsany, in which a great number of new and interesting facts have been brought before us. I must say I have also listened to it with very great surprise; for it is the first time in my life that I have heard the question of the legality of the use of torpedoes discussed. I have always hitherto considered torpedoes as much an article of legitimate warfare as shot, shell, or any other way by which we destroy our enemies. I am not connected with the Gunnery or Torpedo School; but should I be appointed in case of war to any position of trust, I can only say I should use torpedoes myself, and should expect my enemies to use them, and of course, as Major Cameron said, we must "keep our eyes skinned" to avoid them. There is one thing in which I think we, as Englishmen, gain by the introduction of torpedoes, and that is in the defence of our numerous harbours. We may erect forts; but I have no hesitation in saying that wherever there is a free course for steam ships no artillery can keep those ships out. The use of artillery is to destroy ships when they are brought up under some obstruction, whether torpedoes or a boom; but Admirals Farragut and Porter proved in the Mississippi that no amount of artillery power would prevent ships from passing forts. Therefore, I say, without the use of torpedoes, our harbours are defenceless before the attacks of any privateers who choose to come. There is another fact which we must consider in dealing with this question, and that is that we should find if torpedoes did not come into use, that the naval actions of the future would be decided by ramming, for owing to the rapid changes of distance between two antagonistic ships you would scarcely ever find that a shot would hit. The result would be that the two ships running at one another, if both were handled with equal nerve and pluck, both must go down. Now, by the use of torpedoes, although your enemy may go down as the result of a torpedo which you send, it would have no such disastrous effect upon your own ship; therefore the result will be that actions in future in naval warfare will be fought much more cautiously than they would be before the introduction of torpedoes. Lord Dunsany has also given us a good deal of international law. Now, I am rather inclined to think that this international law works for our disadvantage, and had better be left alone by naval Officers. During the American War there was one case where international law came in, and that was when Wilkes took Mason and Slidell out of the "Trent," pleading in justification various authorities in inter-

national law. Whether his international law was right or wrong I do not know; but when America saw that England was determined, those men were given up. Amongst the numerous complaints made by the Americans against the English during their Civil War there was not a single charge made against the Navy. The officers used common sense, and I think, as a rule, that common sense comes before international law. On the question of torpedoes, I see a gallant Torpedo Officer present who may, perhaps, take up the cudgels and defend his own case. I have only reason to express my surprise at their being considered at all illegal.

The Right Honourable MONTAGUE BERNARD: I must apologise for rising to speak upon the subject when there are so many present who are more competent than I am to do so. However, Lord Dunsany has done me the honour of referring in his observations to an essay of mine written nearly a quarter of a century ago. I should like to say one word with reference to what has fallen from Lord Dunsany. Perhaps he will allow me to say, as a civilian, that I am extremely obliged to him for what he has been good enough to tell us. I have derived great instruction from it, and it has been extremely interesting to me, as it no doubt has been to persons more concerned in the matter than I can be. The best way to treat international lawyers is to treat them as what they really are; that is to say, as persons whose business it is not to make laws on these subjects, because, as Lord Dunsany has told us, these laws are really made by practice, that is to say, by soldiers and sailors, by Generals and Admirals, and by their Governments, and not by persons sitting in their studies. But a useful service sometimes may be done by a person who sits in his study, and endeavours to do what soldiers and sailors cannot; that is to examine and collect the various usages which are in force, and inform others what those usages are. The laws of war are nothing at all but the usages according to which warfare by land and sea is carried on. If anybody denies that such usages exist, I think he can neither have seen anything of war nor have read anything about it. A naval Officer commanding a vessel engaged in war would not hesitate to use a neutral flag in approaching an enemy's ship; but nothing would induce him to fire into his enemy before hauling down the neutral flag. Why is that? Because usage permits you to use a neutral flag in approaching an adversary, while, on the other hand, it is a definite and distinct rule that you must not fire into him until you have raised your own colours. The collection of the whole body of usages—and they are not so many as people suppose—represents what we call the laws of war. Lord Dunsany referred to a passage I had quoted from the Duke of Wellington's despatches, in which the Duke wrote to Don Carlos d'España, who was besieging Pamplona, ordering him to decimate the French garrison should they destroy the fortifications when their relief had become clearly hopeless. The Duke of Wellington supposed in that case, not that he was about to commit an act in opposition to the laws of war, but that he was actually enforcing a particular rule or law of war that existed in his time. Perhaps Lord Dunsany did less than justice to two eminent persons to whom he referred as having given an opinion as to a question that arose in the French War, for I think he quoted Messrs. Calvo and Heffter as being Frenchmen. The fact is, that one of those jurists is a Spanish American and the other is a German.

Lord DUNSANY: I did not mean to say that Heffter was on the French side. It was Calvo from whom I have some very long quotations, although I did not read them.

Mr. MONTAGUE BERNARD: I thought your Lordship spoke of Heffter as a French authority, but doubtless I was mistaken. His book is translated into French; but he wrote in German. On the main point I really feel this, and you will permit me, though a civilian, to say so. It is of material consequence that we should maintain firmly the distinction between what is fair warfare and what is not fair warfare. If you allow a particular mode of warfare to be fair and legitimate, and at the same time say that you will cut the throats of the persons who are engaged in it when you get hold of them, then I say you destroy and confuse that distinction. Do let us bear in mind that there are fair modes of carrying on war, and that there are unfair modes. Poisoning a well is not considered a fair mode of carrying on war, nor is the sending an unscrupulous person to assassinate a Commander-in-Chief. For my part I confess that the sending an infernal machine that looks like a mere

piece of coal into an enemy's country is worse to my mind than even poisoning an enemy's Officer, because you cannot foresee what destruction it may cause, or who may be the sufferers. I can conceive nothing that falls more thoroughly within the description of an unfair mode of warfare than that. There are permitted acts, no doubt, that very nearly approach the line. If, in the disguise of a neutral, you come as close to a hostile ship as you can, then suddenly haul down your flag and fire a broadside, that is getting very closely to the prohibited line; still it is not prohibited, and since that is known you have to be on your guard against it. Lord Dunsany referred to the practice of hanging spies. Now, if any man goes into an enemy's lines in uniform and is taken prisoner, every one knows he is not hung; but if he goes in a smock frock or a blouse, and pretends to be a civilian, while all the time he is a soldier, he may be hung; and if a civilian goes and pretends to be engaged in no hostile business, whilst all the time he is engaged in a most mischievous operation of war, that of gaining information about the numbers and positions of an enemy, the practice of war is to hang him likewise. Why? Because each of them is making use of the dress and appearance of peace in order to carry on a hostile operation; and unless you prevent that by measures of severity it would be impossible to distinguish between those who were at peace and those who were at war, and you would have to adopt severities of a much wider and more oppressive kind. I venture therefore to say that you should not, simply on the ground that in these cases you have immense destruction wrought with small means—I do not say with small risk, because the risk is generally great—if the means themselves are recognised as fair, think of hanging the men when caught, or refusing them quarter. As to the practice of laying down torpedoes at the entrances to harbours and the like, no doubt there is this to be considered. You ought to be careful how you use means which may take effect, not only against combatants, but also against non-combatants. The laying down of a torpedo at the entrance to a commercial port, everybody, I should think, would condemn, even if there happened to be in that commercial port an enemy's ship of war likely to come out. In this matter I do not know that any absolute rule can be laid down. You have to do your best to attack and destroy your enemy; but our Officers, in the bombardment of towns, and other like operations, have never failed to follow one rule, that is, to avoid, as far as possible, the destruction of non-combatants. That is the practice we pursued in the Russian War and everywhere else, and that, no doubt, is a thing always to be borne in mind. Beyond that, I do not know that there is really much to be said. I hope that Lord Dunsany will pardon me for offering these criticisms upon his interesting paper.

The CHAIRMAN: We have a Torpedo Officer present who has been referred to. We shall be very glad to hear anything he may have to say.

Commander ARTHUR WILSON, R.N.: I came here, Sir, simply to listen to what was going to be said against torpedo warfare, but I do not think I have any remarks to offer upon the subject.

The CHAIRMAN: If you have heard anything against it, perhaps you can say something in its defence.

Commander WILSON: I hardly know exactly the line that the argument has taken. However, I may state this: it is a kind of warfare that has been in use in every country of which I have known anything since 1853. It was used against us in the Russian War: it was used in the American War; it was used in the wars of the South American Republics; it was used in the war between Austria and Italy for the defence of Venice: it was certainly used for the defence of German harbours during the Franco-German War; and it has also been used in the present war which has just come to a close. After a weapon has been so used for so long a time, there can be no pretence for saying that it is unfair. As to the methods of dealing with people who lead attacks in torpedo-boats, that, I think, must be left to the Commander-in-Chief at the time. For my own part I do not know of any precedent for saying that a man who leads a torpedo attack should be hung. If a man does attempt to attack in an out-rigger torpedo-boat, and so on, of course he must take his chance of being shot if taken red-handed in the act. For my own part I look upon a person in a torpedo-boat attacking a ship very much as a soldier in a rifle-pit. If you see a soldier in a rifle-pit with his rifle pointed towards you, you are not

likely to give him much quarter, at all events until he drops his rifle. In the same way, as long as the person in the torpedo-boat has his weapon, which he can use with effect, you are not likely to give him any quarter. It is not likely when you storm rifle-pits, and half your men are shot down, that you will be at all merciful to the men in the pits at the time; but if you take a torpedo-boat, and then, some time afterwards, when you have had time to cool, you talk of hanging the crew, I think that is not according to the rules of civilised war.

Major CAMERON: May I be allowed to add a word or two? Lord Dunsany referred to the Thorneycroft launches. I think he rather stole a march on us when he spoke of their attaining thirty knots speed. It may, however, be satisfactory to to those who are not behind the scenes to know that on board the "Excellent," and also in Woolwich Arsenal, means are being taken for providing mitrailleuses with steel bullets, which will penetrate these torpedo-boats at 200 yards and upwards. That, I think, will make the interior of such torpedo-boats uncommonly hot for the Officers and crew.

Commander GILMORE, R.N.: Lord Dunsany has touched upon torpedoes—can there be aërial as well as submarine torpedoes? Many years ago, when Venice was blockaded by the Austrian fleet, a paddle steamer called the "Vesuvio" had a sort of inverted parachute fitted on the poop; in this parachute balloons were inflated, to which were suspended huge shells. When the wind blew on the land the balloon and shell were sent up; to the balloon was attached a bag of powder and a slow match, the match calculated to ignite the powder when the balloon was over Venice. The match exploded the powder, which blew up the balloon and ignited the fuse of the released shell, which came whirling down. Several of the shells fell in the channel, though none, I think, ever got near Venice itself.

Colonel COLOMB, R.A.: I do not know whether I may make one observation? I unfortunately did not hear the whole of Lord Dunsany's lecture, but I heard the noble lord's remark that these destructive weapons were not exactly approved of by this country, and for a very good reason—that they would be directed against our maritime supremacy. With reference to this new development of Greek fire—or whatever else it may be called—of which we have heard, I do not know whether it has been legalised, but for my part I hope it will not be adopted by any civilised nation. I think it is the duty of this country, whilst tolerating these new destructive inventions, and using them when they are adopted, at the same time to consider whether, as they may be directed against this country, it would not be better to endeavour to discountenance them altogether. There is no doubt that as torpedoes and all these kinds of destructive weapons militate against our dominion of the seas, the principal business of this country should be to put itself on the defensive against these things. I hope the proper authorities are especially considering every proper measure to guard against the destruction of our ships by torpedoes.

Captain R. A. E. SCOTT, R.N.: I should not like the meeting to break up without saying a word with reference to the idea that the introduction of torpedoes is to militate against the power of this country. It is just the reverse, for the more destructive the weapon, the more pluck and dash is required in its use. I was speaking the other day to one gentleman largely concerned in the manufacture of torpedoes, and I said to him, "You are sending these weapons to other countries, "in order that they may destroy us." "My dear sir," he said, "when they have got "them, they won't be able to use them." The value of the torpedo is undoubtedly on the side of the defence; and to us, with our large mercantile fleet, as well as an immense flotilla of coasters round our shores, the torpedo will prove a most valuable weapon. Arming these vessels would enable us to send the whole of our fleet to protect our commerce by means of the torpedo. Our colonies will be enabled to defend themselves, and hence we shall have a greater superiority at sea than we have ever before enjoyed.

The CHAIRMAN: I should like to ask Lord Dunsany a question before he replies. As I gather from your Lordship's argument, you would treat with stern justice the persons employed in a torpedo-boat. I wanted to ask you this: that torpedo-boat, I presume, you send away from a vessel. Supposing subsequently you captured that vessel, in what manner would you treat the Captain or the Admiral flying his flag in the vessel from which the torpedo-boat had been sent?

Lord DUNSANY: I will only say that that is one of the innumerable difficulties that do present themselves. One sees many occasions on which a sentimental answer can be given in a moment,—"Hang him!" but when you really come to draw a distinction, it is exceedingly hard. And I can tell you more than that. Although I am not of the school of Grotius—not Grotius, he is not one of the atrocity-mongers—though I am not of the school of those who defend poisoning, I am not perfectly sure that there could not be something said in favour of poisoning wells. We have heard something about poisoning the air. The French some time ago had what they called *bullets asphyxiants*. These would have utterly poisoned a whole ship's crew. If those missiles may be used, then it comes to this, that it is lawful to poison the air, but not lawful to poison the water. That is an exceedingly hard point to deal with, and it was rather with a view of eliciting your opinions than of expressing any of my own that I proposed to give this lecture. I should be very sorry indeed if any gentleman, more especially Mr. Bernard, who is not only a distinguished writer, but a gentleman who has efficiently served his country as a jurist, should think that I spoke of him otherwise than with the sincere respect that I feel. With regard to the Officers of the Torpedo School, I believe that they really comprise some of the flower of our services, and it would be exceedingly ungrateful on my part, having received great courtesy and hospitality from them last summer, to speak otherwise than with great respect of them. I think they are doing their duty most zealously and efficiently. I express no opinion as to whether torpedoes, taken in the sense in which we commonly use them, are illegal or not. Some gentleman understood me to say that I should hang all the people employed in torpedo-boats. I never dreamt of anything of the kind. There seems to me to be an enormous difference between refusing quarter and executing people in cold blood. The fact is, in practice there are innumerable cases which do not get into the newspapers, and which are not dwelt upon as atrocities, where simply the Commanding Officers do not say a word, and where the soldiers engaged give no quarter. I believe that was done over and over again in the Sepoy War, where I think it was just and expedient.

The CHAIRMAN: We have only one more duty to perform. I am sure we shall all tender our best thanks to Lord Dunsany for his lecture. Whatever opinions we may have as to the manner in which the Officers using torpedoes are to be treated, we are no doubt unanimous in thanking Lord Dunsany for having so kindly brought this important subject before us.

LECTURE.

Friday, March 15th, 1878.

THOMAS BRASSEY, Esq., M.P., &c., &c., in the Chair.

SOME OF THE TRUE BASES FOR A RULE OF THE ROAD AT SEA.

By Captain P. H. Colomb, R.N.

The controversies as to the rule of the road at sea, and its relation to collisions, are, to many minds, a weariness and a trouble. It seems to some as if they were eternal, and that we neither arrived at satisfactory conclusions nor brought about any diminution of the number of collisions. I am so far in agreement with these persons as to think that much of the controversy has been unnecessary, and that some of it has done more harm than good. But, in the main, I am persuaded that progress has been made, and that, however difficult it may be to trace it in the records of collisions since 1866, there are fewer disasters of that kind now, than there would have been had these controversies never arisen. Some truth has been struck out of the many minds employed in the discussion, and some changes have been established by law, which can be shown to tend in the right direction.

Since Captain Brent and I, and those who acted with us, began to discuss these questions, eleven years have elapsed. In those years I have had the satisfaction of observing that the *design* of the changes which have since become law, has been altogether in the direction which our studies had led us to believe proper and judicious.

Before 1866, almost all seamen, and perhaps both the great maritime law courts, were of opinion that it was safe and judicious to advise porting the helm whenever the person in command of the ship felt himself in doubt as to the approach of another ship. The columns of the *Shipping Gazette* quite flowed with objections to the view I put forward, that the law of port helm should be abolished. The Mercantile Marine with almost one voice declared that it was not the restriction, but the extension, of that law, which was really wanted. Then Captain Brent and I published our "Law of Port Helm," in which we showed, by a direct appeal to the records of the Admiralty Court, that, out of 86 cases of collision, 54 were absolutely due to the

wrongful use of port helm, and that in 25 of these cases there had been no original risk whatever, and that only for the law, the ships would never have gone near one another at all. It was impossible to get over such an appeal to fact, and very soon the Board of Trade began to teach that port helm should be very much restricted. Then followed the well-known explanatory clauses legalizing this restriction, but of course in the teeth of the general opinion of the Mercantile Marine.

I was, and remain, sorry that a bolder policy was not pursued on this occasion; but I was, and am, bound to admit that, so far as they went, *the design* of these explanatory clauses was in the right direction.

But I saw that they might be made to go much further towards true law, than the framers of them were perhaps at first aware. The worst collisions brought about by the conflict of the "crossing" rules in Articles 12 and 14, and the "end-on" rules in Articles 11 and 13, all happened at night, and therefore depended on the side lights observed by either ship on board the other. The law properly prescribed that these lights should be so fitted that the *green* light should not show on the *port* bow, nor the *red* light on the *starboard* bow, of the ship carrying them. The explanatory clauses issued in 1868 limited the obligation to port the helm at night to those cases where each ship saw both side lights of the other. I reflected that, if the lights were fitted in accordance with the law, so that neither should show across the line of keel, no single pair of eyes could see both at the same moment, and therefore, if we once got the lights accurately fitted, the law of port helm, instead of being only restricted, as the explanatory clauses put it, would be altogether abolished at night, as it could never happen that both ships saw both side lights of the other. I accordingly took steps to put the case before those in power at the Board of Trade, and, after a time, instructions were issued nearly in accordance with my views; and at this moment few British ships show both side lights together, except at long ranges, and even then only for instants of time.[1] You may observe, therefore, that the appeal to fact as against port helm has almost absolutely killed that erroneous law, at least when its action was most disastrous, namely at night.

But port helm is not yet dead in the day-time. Only a few months ago I was travelling in a mail steamer at the rate of 12 knots, in broad daylight, when another very large steamer appeared on our starboard bow, steering a course exactly opposite to our own. As we neared one another, the commander of my ship—a most thoughtful and prudent officer—drew my attention to our relative positions, with the view of showing me that the masts of each ship must appear sufficiently open to the other to make any change of course on either part unnecessary. I quite agreed, but said, "The worst of it is, that we

[1] Thus, the "Rosa Madalina" reports, December 9, 1877, a "strange vessel," with which she afterwards came into collision, "showing red and green lights alternately." This is now the usual appearance when right ahead of a ship. See *Ship. Gazette*, December 13, 1877.

"cannot, under the present law, be certain that our neighbour thinks "as we do, for, after all, he may think the masts are 'nearly in line.'" I had hardly uttered the words, when the said neighbour suddenly ported across our bows! No harm came of it, or I should not be here to mention the fact; but all the elements of a collision were present except those very common ones of nervous excitement and want of presence of mind.

Yet, though port helm is "not yet quite dead," it is certainly dying. The French Government has advised our own, in perfect accordance with true progress, that Article 11—the law of port helm for sailing ships—ought to be struck out altogether; and our own Board of Trade has noted that the idea "seems worth consideration."[1] That rule will most probably disappear at the next revision.

In another direction the small end of a very philosophical wedge is being driven in. Ten years ago in this theatre we were advocating the principle of "warning signals" between ships approaching towards collision. Two years later, the United States Navy officially adopted the identical signals then described. There was, however, a discrepancy in the circular adopting them, which led to its withdrawal at the instance of our own Board of Trade. The principle of warning signals, expressive of an *intention* to starboard, or to port,—which was the "true base" I contended for,—is now admitted, and we are, I understand, to have a set of warning signals by sound, which may be made most useful so far as they go. At the next revision of the rule of the road, other signals will probably follow, for it is only a misapprehension of their intended use which has hitherto kept them back.[2]

Lastly, a restoration of the old river rule, which Captain Brent and I contended for in 1866–7, is about to take place, and if it be properly worded, and properly explained by the courts, the best results may be hoped for.

Though I cannot altogether approve of the means which have been employed to carry out these *designs*, yet on such a review of our progress, only those who still uphold a compulsory helm law, applicable to all ships, can feel much disappointment; but it has to be remembered that controversy has been the moving power, and that the views of the minority have prevailed.

If you ask how it is that this is so, I should tell you that the minority have gone to the facts, and, reasoning inductively, have shown whereabouts the "true bases for a rule of the road" lie. The work is still incomplete, inasmuch as the several designs can be better carried out, and it is quite possible to reduce the present percentage of collisions by one-half, if only these "true bases" are thoroughly investigated and embodied in law and teaching. I am here to-day simply to push the enquiry a little deeper than usual, and to disclose

[1] Parliamentary paper, "Rule of Road at Sea," July 23, 1874, page 41.

[2] The value of warning signals is so very obvious that we find ships endeavouring to get up a code of their own. The "Ocean," on December 9, 1877, deposes to "making signals with a fog-horn," to try and avoid collision with another ship in clear weather.—*Ship. Gazette*, December 14, 1877. So also the "Forest" shows a flare-up to the "Avalanche," to induce her to bear up.

one or two broad bases on which the practice of seamen ought to rest, and which, being "true bases," will, when used, reduce the numbers of collisions.

In discussing these matters my difficulty has always been to induce those interested, to go to the FACTS. There are mathematical certainties underlying all cases of collision which are never appealed to. There are records of collision cases which show that these mathematical certainties may be relied on, yet those who frame rules and teach under these rules, make no use of the instruments ready to their hands. More time is spent in discussing whether the word "shall" or the word "may" ought to stand part of a law, than was ever spent on the principle of the law itself. It results that the vaguest notions prevail about collisions at sea, and ships are looked upon, and treated, as if they were cabs.

I am about to-day to show you what would be mathematically right and mathematically wrong movements in all ordinary cases of collision in the open sea: and then I am going to show you by an appeal to recorded facts, that theoretically right movements do not, but that theoretically wrong movements do, almost invariably, accompany or precede collision. And my proposal is that we should officially and privately teach seamen to employ these right movements and eschew these wrong movements, so far that is as we can employ them under the present still imperfect law. I have had substance and facts enough to make not less than three papers on this head alone, and if my present paper should seem incomplete, it will be due only to unsuccessful compression.

When we consider the movements which it is competent to any ship to make in order to avoid collision with another, we have evidently to think of her in three different conditions, namely: as a ship under steam alone; as a ship close-hauled under sail; and as free or before the wind under sail. The behaviour of ships under sail has not been so closely investigated as that of ships under steam alone, and even the latter has by no means been completely studied; but enough has been established as to the laws which govern the path of a steam-ship when acted on by varied helm and speed, to enable me to deal pretty fully to-day with the steamer, and by inference with the sailing ship.

If a steam-ship, proceeding at speed, has her helm put over either way, her path will become a spiral, ultimately merging into a circular arc. Considering the spiral part of the arc as actually circular—which for all to-day's purposes is a just hypothesis—then we are able to say that its radius will depend upon three things:—(1) The length of the ship. (2) The helm angle. (3) The speed. The longer the ship, the greater will be the radius. The greater the helm angle up to 45°, the less will be the radius. The less the speed, the smaller will be the radius.

These are the laws so far as *space* is concerned, but it is evident that *time* is also involved. (1) The longer the ship, the greater will be the time of turning over a given arc. (2) The greater the helm angle up to 45°, the less will be the time occupied in turning over a given arc. (3) The less the speed, the greater will be the time in turning

over a given arc. We have lastly to note the relations between *time* and *space*. Thus, the increase of the helm angle up to 45°, though it reduces the radius of the arc, does not reduce the time of turning in so great a proportion. The decrease of speed, though it reduces the radius of the arc, does not reduce it so much as it reduces the time of turning.[1] Lastly, it must noticed that the helm angle reduces the speed over the arc below that which the ship held when on a straight course.[2]

When we come to apply these theoretical data to practice, it is evident that we must deal with average figures. Ships vary in length, in rudder area, in helm angle, and in speed; and we cannot, therefore, assume any fixed conditions for all classes of ships. But we can do this: we can take a ship of average length and average speed, and we can see, by a reference to various experimental data, what such a ship is capable of doing. We can then express her capacities in terms of her length, both as to space and time, and then we can say that to any other steam-ships these figures may be reasonably applied. We shall know, in short, pretty well what any steamer *cannot do* by varying her helm and speed, though we may not be able to say so well what she can do. But I must note in passing that whatever mistake may be made in assuming these average manœuvring powers—whether we credit our ships with greater, or with less powers than they actually possess, it will not affect the scope of my argument or falsify in any respect my reasoning. We shall be dealing with two ships invariably, when we come to apply the theory practically, and whatever we assume wrongly for one ship will be corrected by a similar assumption for the other. But I shall, in any case, take a reasonable basis to work on.

[1] So far as I know, Vice-Admiral Sir Cooper Key was the first to formulate these fundamental laws. I find in an official report of his on experiments carried out under his supervision, and in which I had the honour of assisting, the following words:—

"February 12, 1863.

"An increased area of rudder reduces the *diameter* of the circle described; reduces "the *time* of describing the first quadrant; but increases the time of completing the "whole circle, on account of the vessel's way being reduced.

"An increase in the speed of the vessel increases the diameter of the circle, and "decreases the time of completing it.

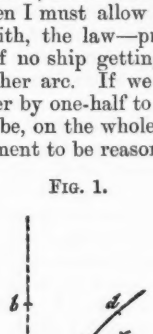
"All other circumstances being the same, the diameter of the circle and the time "of turning are both reduced by increasing the angle of the rudder up to 45°."

These enunciations of fact have never been questioned. The late French author, M. Lewal, however, denied that a reduced speed has any effect on the radius of the last part of the arc, which he thought was equal in the same ship at all speeds. He concluded, however, that while at 12 knots the spirality was very great indeed, it almost entirely disappeared at four knots, and the whole curve became very nearly circular. See "Principes des Evolutions Navales;" also numerous papers in the Revue Maritime et Coloniale. For English references, see my "Modern Naval Tactics," Royal United Service Journal, 1865; my "Attack and Defence of Fleets," *ibid.*, Vol. XV. See also an article in the first volume of "Naval Science," "The "Theory and Practice of avoiding Collisions at Sea."

[2] The speed of the engines in a screw ship is invariably reduced by the act of putting the helm over, partly, no doubt, from the difficulty the water has of escaping after being thrown off from the screw, but more, I think, because the inertia of the ship has ceased to act in a line with the keel.

If, then, I take as an average radius of the arc described, 2½ times the length, I shall use a measure which is something greater than the possibilities at very low speeds, and something less than the fact at very high speeds. But then I must allow for a reduced speed being used by the ships I deal with, the law—properly, I think—enforcing such reduction. I know of no ship getting below a radius of twice her length in turning over her arc. If we suppose that she reduces her speed through the water by one-half to effect this reduction in the radius of the arc, we shall be, on the whole, using figures which have been ascertained by experiment to be reasonable.[1]

FIG. 1.



We are now in a position to draw a diagram illustrating the manœuvring powers of a steam-ship, which I have done in Fig. 1. Here we have the steam-ship, X, proceeding at speed towards the point *b*, from which her stem is distant two ships' lengths. If she puts her helm hard a-port, she will then, instead of going towards *b*, pass over some curve, X*cd*, which, as I have explained, we take as the arc of a circle whose radius is 2½ times the length. If there were no retardation due to helm angle, the stem of X would reach the points *c* and *d* in the same time as it would have reached *a* and *b* had she kept her course. What amount of retardation must we calculate on to be reasonable? Time does not allow me now to refer to the data upon which I say that we should calculate on a reduction of speed equal to about one-third,[2] but upon mature consideration I place it at

[1] M. Lewal, from experiments with twenty-nine ships of all sizes, from a steam launch, 32 feet long, to the "Achilles," of 380 feet, found that the average radius was 3·15 times the length. The speed varied from 12 knots to 3·2 knots. The least recorded radius was with a gun-boat and a specially enlarged rudder at the speed of 3·2 knots, and she gave a radius of 2·5 lengths for her arc (see "Principes," page 11). The "Achilles," "Warrior," "Bellerophon," and "Lord Clyde," at 12 knots described arcs whose radius averaged 2·4 times the average length. At 5 knots the same ships averaged 2·2 times their length. See Reed, "Our Ironclad Ships," pp. 179, 181.

[2] The data, such as it is, may, however, be given in the following note:—Sir Cooper Key found that when a gunboat with a large area of rudder had her helm put hard

that figure. The result of this retardation, when reduced to diagram, is that X will only reach the point x^1 with her helm a-port, in the time it would have taken her to reach b had she continued her course. A similar result necessarily accompanies the action of starboard helm.

We have allowed that if the ship, X, can turn along the curve X*cd* by the simple action of her helm, she has a certain power of reducing the radius of her arc by reduction of speed. We can hardly, in the face of experiments, expect to get over the reduced arc by a less reduction of speed than one-half of whatever it was normally, so that if the stem of X would reach the point b in any given time with the helm amidships, we cannot expect it to get farther than x^2 in the same time, under the action of the helm angle and reduced speed.

Such are the manœuvring powers of a steam-ship so far as helm, or helm and speed combined, are concerned. She has also powers—not yet placed under any general laws—of reducing and increasing her speed without altering her course, but we need not in this paper investigate them.

We can very readily infer from the laws ascertained for steamers, those which must, in a greater or less degree, govern the manœuvring powers of sailing ships. For, consider X as a sailing ship close-hauled on the starboard tack, and, like the steamer, putting her helm a-port to avoid collision. Then we can see that the original propelling power of the wind becomes at once reduced, while the retarding effect of the helm remains as in the steamer. These two causes would bring the stem of X, as a sailing ship, only to the point x^2 in the time it would have taken it to reach the point b, had she continued her course. It is to be observed that the curve X*cd* is not open to X as a sailing ship close-hauled on the starboard tack, for that presupposes a continuance of the original motive power, which may be true of the steam-ship, but cannot be true for the sailing ship near the wind, as the propelling power of the latter begins to lessen directly the helm is put down.

If the ship X were a sailing ship close-hauled on the port tack, the case would evidently be different. The pressure of wind and water together is generally such as to over-balance the ship and make her tend to fly up in the wind, consequently when the helm is put "hard-"up"—in the case of X on the port tack "hard a-port"—some of its

over, she reduced her speed over a complete turn from 7 to 2½ knots. It is probable that the reduction over the first part of the arc was rather less than this, while the reduction over the last part was rather more. M. Lewal has some useful remarks, but not very much data on this branch of his subject, as it is so mingled with the times occupied in putting the helm over! But he shows in one ship a reduction of 1·65 knots on 9·0 knots, helm angle only 30°. In another, 2·8 knots on a speed of 12·3 knots, helm angle 28° only, and so on. (See "Principes," pp. 21 and 290, &c.) The "Bellerophon" reduced her speed from 12 knots with helm amidships to 7·8 knots over her arc. The "Achilles," "Warrior," "Bellerophon," and "Lord Clyde," from a mean speed of 12 knots on a straight course, reduced it to a mean speed of 8·3 knots over the arc. The same ships from a mean speed of 5 knots, reduced it to a mean speed of 4·2 over the arc.

As in laying down practical rules for avoiding collision, we must keep them well within the possibilities; it seems upon the whole that if we allow a 2½-length radius, we cannot allow less than a reduction of one-third in speed.

turning power is lost at first, being already expended in keeping the ship on her course. The propelling power of the wind is, on the other hand, an increasing one as the ship goes off. If we gave less helm in a steamer and increased the speed at the same time, we should certainly get a larger arc and greater speed over it; and this is exactly what we do get in "bearing-up" under sail. Like causes produce the like effects, and we know that while the speed through the water almost at once begins to increase, when we get a little off the wind in a "bearing-up" ship, the turn through a given number of points is slow in time. Later on, the speed increases as the wind gains more and more power, and the turn through the given number of points becomes more rapid until at last the ship flies into the wind on the other tack. This phenomenon is probably due to the continually diminishing action of the sails against the helm, its complete neutrality, and then its assistance to the helm.

But we are now only concerned with the first part of the arc described, which, I think it will be seen, cannot greatly differ from that of a steamer. Its spirality will be somewhat greater, but I imagine not such as to interfere with my assumption that the stem of X as a sailing vessel close-hauled on the port tack will, in bearing-up, reach the point x^1, when, had she kept her course, it would have reached the point b. This can hardly be an exact statement, but I think it a reasonable generality. It is to be remarked that X, as a "bearing-up" ship under sail, is not without stopping powers equal to, or perhaps greater than those of a steamer. Simply letting go the lee braces will at once spill the sails, and deprive them of their propelling power, while bracing the head yards a-box will have somewhat the same result as the reversal of a steamer's engines. Close-hauled ships on either tack have, therefore, in the generality of cases, quite as great stopping and reversing powers as steamers, by the use of their braces in throwing sails aback.

If we lastly consider X in Fig. 1 as a sailing-ship with the wind quarterly, or right astern, we shall at once observe that her early motion under port or starboard helm must be very nearly identical with that of a steamer. The propelling power does not vary greatly, while the retarding and turning powers of the helm remain. X, as a free-sailing ship under port helm, may be safely assumed to reach x^1 in the time it would have taken her to reach b under a steady helm. But the free-sailing ship is at a tremendous disadvantage when compared with any other that sails the seas. She has no power of suddenly stopping her way—of reducing her speed—and therefore her power to avoid collision is limited to the use of the helm. She cannot, as a steamer can, turn along the smaller curve X*ef*, nor can she by any arrangement make her stem only reach x^2 when with helm amidships it would have reached b.

Thus we see that on the whole, sailing-ships near the wind are—so far as their powers of avoiding collisions go—in the same case as steamers, when bearing-up; and as steamers with reduced speed or stopped engines when luffing. Free-sailing ships represent steamers deprived of their powers of stopping and reversing.

The whole of the foregoing facts and inferences form some of the chief of those "True Bases" which have given a title to my lecture.

Let us now proceed to the consideration of how the laws we have just discussed affect the avoidance or the bringing about of collision between any two ships. It is evident that the avoidance of collision will greatly depend on a knowledge of true laws and their application to each case, and we shall get a strange and strong confirmation of the laws now enunciated, if we find, on appeal to what takes place at sea, that collisions are commonly accompanied by acts setting these fundamental laws at defiance.

As I am now at work only on the broad bases of a rule of the road, I only propose to deal with the general case of collision. The common case, the average case, and that within whose limits lie the mass of the collisions, and the vast majority of the real disasters, is the case of "crossing ships." This case under the existing law covers indefinite ground, and is governed by three articles in the steering and sailing rules, those, namely, numbered 12, 14, and 18. These articles prescribe that in all cases where two ships are "*crossing so as to involve risk of collision*," one of the two is to "*keep out of the way*" of the other, and the other is to "*keep her course*." The law involved in these articles clearly pre-supposes three things. It assumes—(1) That ships are crossing; (2) That a risk of collision is involved in the crossing; and (3) That there is no impediment to the free action of either ship in obeying the law.

When ships are said to be "*crossing*," it is clear that they are both steering to some single point ahead of each ship. If the speed of each ship, or the relative distance in time to this point, be such that either ship must have passed it long before the other can reach it, then the ships are indeed "*crossing*," but there is no "*risk of collision*." With such cases as this, law has, very properly, nothing to do. Law only interferes for the assurance of mutual safety, and the safety of such ships is in no way menaced.

But when this point—which I have always called the "*collision point*" is at such relative distances ahead of each ship as to make it in the least degree probable that, with their relative speeds, neither ship can pass before the other is up to the point, then we have not only "crossing ships," but "*crossing ships with risk of collision*." In such a case the law is bound to step in, for otherwise both ships would be left without that "understanding"[1] which is necessary between them. Without law, neither ship would "know what the other "is likely to do,"[2] and the acts of the one towards mutual safety might possibly thwart those of the other.

Now law might step in in several ways. It once said that two ships under these conditions were each to turn to the right, but it is

[1] Captain Heathcote says: "The principal object in instituting such rules should "be, to establish an understanding between the officers of the two vessels." Parliamentary paper, Rule of Road, April 22, 1872, page 8.

[2] "The principal object of all rules . . . is to enable one of two ships to know "what the other is likely to do."—Board of Trade, in Parliamentary paper, Rule of Road, August 15, 1871, p. 22.

evident that if there is such a thing as a right and a wrong movement, the law prescribed that half the number of ships which met in this way were to do that which was wrong. But law might, without committing this blunder, prescribe movements to each ship which it might hold to be right. It might say that each should turn *from* the other, or in Mr. Stirling Lacon's well-known words, that "the "one having the other on her starboard side should starboard, and "the one having the other on her port side should port." Under the law of port helm, each ship was ordered to make a movement which relatively to the other was its opposite. But in ordering each ship to turn *from* the other, the movements are relatively alike. So also law might prescribe that each crossing ship was to turn *towards* the other, until they were on parallel courses, and then pass clear. In all these cases the common understanding is got at, and each ship may know what to expect from the other. In the case of port helm, and of the turn *towards* each other also, the ships will, if no collision arises, be presently free to resume their original courses in safety. In the turn *from* each other, however, some further provision must be made, or else the ships can never resume their original courses.

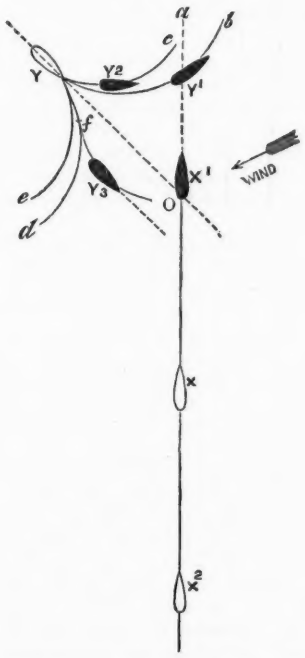
But the law has in fact chosen the third and last plan, in that which it has adopted, and it is not my purpose here to enquire whether that plan be bad or good in comparison with the others, because that might lead to a discussion as to the *design* of the law on the one hand, and the means which have been used to carry it into practice on the other. It is sufficient at the moment to note the words of the law, as I have given them, and to criticise its results, especially in the teaching, ruling, and practice which have grown up under it. Time will not permit me to do much more on this occasion than to take an ordinary everyday meeting of ships which are "crossing with risk of "collision," and to argue the general case from that instance. But I assure you that what I show to be true of the general case, is also true of any particular case, in a greater or less degree.

Suppose then, that X and Y in Fig. 2 are two ships steering towards the common point O, termed, as I propose, the collision point, which is ahead of each. They are, evidently, "crossing ships," but whether they are "crossing so as to involve risk of collision" will depend on their relative distances from the collision point and their relative speeds. In the diagram they are placed equally distant in space from the collision point, and if their respective speeds were also nearly equal, there is the chance that neither can pass the collision point before the other has reached it. Such a condition evidently makes a risk of collision. But suppose X were in the position X^1, with her stem just twice as far from the collision point as before. Then the ships will still be crossing ships, but there will be no risk of collision if their speeds are equal, for then X^2 will only have got to X when the stem of Y has reached the collision point O. The speed of X^2 must, therefore, be nearly twice that of Y, to make a "risk of "collision." These principles can be readily applied to all cases of crossing ships.

In the case of X and Y, the "crossing angle" Y*oa*, is four points

of the compass, but it is evident that the conditions of the problem will only differ in degree whatever the crossing angle may be, so long as it is between 0° and 90°, and so long as the distances from the collision point remain equal. It is clear, however, that while "crossing" is a definite thing, "risk of collision" is an indefinite thing. Both are, of course, matters of fact; but while "crossing" is an exact condition depending on the intersection of two straight lines, "risk of collision" is a variable quantity. There cannot be greater or less "crossing," but there always is a greater or a less "risk of collision."

FIG. 2.



The law has, therefore, attempted to establish a common understanding between the two ships by an appeal to a disputable thesis, and there is, unfortunately, good reason to infer that the thesis is often denied by one or both of the parties to a collision.

Such being the case, it is well that when "crossing" is once established, "risk of collision" should be at once assumed by the ship on whom the onus of avoiding collision lies. It is evident, for instance, that the very instant X and Y ascertain that they are crossing, they must know that if things continue as they are, there

may be a collision at O; and, moreover, that if there is a likelihood of collision, every moment's delay increases the danger. X and Y find themselves, in short, in such a position that the "risk of collision," whether it be great or small, *will grow* with every second's delay in acting, until it either results in collision, or passes its maximum danger without one. The function of law in such a case either is, or should be, to reduce any existing risk of collision to a minimum in the shortest possible time.

X and Y, in clear weather, have very abundant and certain means of ascertaining whether or no they are "crossing ships." In the day time they can see that the port bow of one is towards, or opposite to, the starboard bow of the other. At night, the side lights fitted with mathematical accuracy, show when the green light is opposite to the red. No safer or more indisputable ground for a common appeal than these facts offer has as yet been discovered by seamen or others.

But when we come to the further estimate of "risk of collision," we see at once that *time* must elapse before its probable amount can be determined by either ship, and even then no accuracy is possible. Nothing but an alteration in the compass bearing of X from Y, or of Y from X, is capable of showing that there is no risk of collision; and if there be *no alteration*, then collision becomes *certain* if the respective courses are pursued.

It is, therefore, a fundamental question, whether a "risk of "collision" is a true base for a rule of the road. Time must elapse before it is discovered, and time in such cases is so precious that it seems strange it should be wasted while appeal is being made to it.[1]

But now let us suppose that X and Y are agreed that they are "crossing so as to involve risk of collision," and let us further suppose that they are both steamers, and that each is fully all alive to the law in such a case. This law declares that Y shall "keep out of "the way" of X, and that X shall "keep her course." If the two ships are alone on the high seas, only one thing can relieve X from the duty of keeping her course. This one thing is *proximity so close that it is clearly dangerous for X to keep her course.* But nothing relieves Y of the duty of keeping out of X's way, though after a collision, she may be absolved, if she took proper steps to avoid it on the understanding that X would keep her course. Under close proximity a new condition of things arises. Law has abandoned the case, and a balance of risks and chances must determine the acts of each ship. In Fig. 2, however, the stems of the ships are 7¼ lengths apart, and we must assume that Y should act on the supposition that X will not swerve from her course. How, in such circumstances, should Y interpret the words "keep out of the way"? Some very high authorities think that we cannot give her any advice—at least officially, that we cannot tell her—for instance, that she must, in no case, cross or attempt to cross the bows of X, because "there may "possibly be cases in which a steamer may, in getting out of the way,

[1] No one has put these questions of bearing so well as the present Rear-Admiral de Horsey, in his pamphlet "Rule of the Road at Sea." Ed. Stanford. 1871.

"find it the best and safest course to cross the bows of the other from "port to starboard."[1] Let us examine, by the light of the investigations already made, the truth of this assumed position.

First, of the different things which Y may do, let us suppose she puts her helm hard a-starboard. She will then travel over some curve YY^1b at a speed reduced from the normal rate by one-third. This will place her at Y^1, when X, keeping her course, has reached X^1. The risk of collision has consequently been increased by Y's improper act, from four ships' lengths, which it originally stood at, to about one ship's length; for it is clear that the stem of X^1 will have advanced to that proximity before Y^1 is clear of his path.

But there is a rule which is very wholesome if properly used, and which directs a steamer to reduce her speed when risk of collision arises. Nothing is more likely than that Y, astonished to see the rapid advance of X upon her, should stop, or stop and reverse. If she succeeds in checking her way through the water by one-half, she will find herself in the position Y^2, when X reaches X^1. That is to say, she can now hardly escape collision by any act of her own.

Observe, now, that if X has even a quarter more speed than Y, a collision at Y^1 is almost inevitable unless X acts promptly and properly. Observe also that if Y—as she possibly may—requires a larger arc than YY^1b to turn in, collision becomes still more likely. We must note again that if Y can, by reduced speed, turn along so sharp a curve as YY^2c she has reached the limit of her powers, and that if X is about to run into her on her starboard side, Y under starboard helm is absolutely powerless to help herself.

But now look at the alternative movement which is involved in the direction to Y not to cross, or attempt to cross, the bows of X. Y under port helm and normal speed will turn along some curve Yfd at a rate of progress reduced by one-third. If she reduces her speed she will turn along some smaller curve Ye at a still more reduced rate.

But as Y moves along the curve Yd or Ye, and so approaches more and more to parallel courses with X, X herself is continually helping that movement; so that by the time Y has reached the point f, X will be so much on her port, or safe, bow, that Y may resume her original course in perfect safety and reach the position Y^3 when X is at X^1.

Now, compare the two classes of movement in reference to the amount of alteration of course required. Y, employing the turn *from* the holding-on ship, and using starboard helm without reducing speed, may just succeed in escaping destruction after altering course at least seven points. By reducing speed and altering course more than four points, she remains in immediate danger of destruction. But by employing the turn *towards* the holding-on ship and using port helm, a turn of three points will leave her free to resume her original course in safety. If she also reduces her speed, a still smaller turn will suffice.

Let us make another comparison, using *time* as our standard. Sup-

[1] See Parl. paper, Rule of Road, Aug. 10, 1877.

pose the ships to be of the moderate length of 240 feet, proceeding at the moderate speed of eight knots, then we have a ship's length in space, equal to 18 seconds in time. X and Y under such conditions are originally 72 seconds from collision. In 90 seconds, Y with starboard helm and normal speed, will place the ships at X^1 and Y^1, or with reduced speed at Y^2, and still in danger. But in 45 seconds, Y, by the use of port helm and the turn *towards* the holding-on ship, will be free to resume her course in safety.

Now, suppose that, considering O as a centre, and OY as a radius, we move Y round so as to lessen the crossing angle *Yoa*, it is clear we should carry the positions Y^1, Y^2, Y^3 round with Y as though they were rigidly connected to her. The position Y^1 would soon become one of safety for Y, supposing that the normal speed of X were no greater than her own. Y would then have succeeded in passing the point of maximum danger without a collision. But it would be long before the position Y^2 became a safe one, and it would remain excessively dangerous in every case where the normal speed of X was greater than that of Y. But on the other hand, as Y moves more and more towards the end-on position with regard to X, the position Y^3 becomes continually safer and safer. If in the given positions of X and Y, the latter requires to turn three points towards X before she can resume her original course in safety, it is evident that this turn will be continually diminished the nearer the courses are to placing the ships end-on to one another: while also, as we have seen, all increases in the speed of X increase the danger of Y's turn *from* X, *the same increases add to the convenience and do not increase the danger of Y's turn towards X*. Again, it has to be noticed that as Y approaches the end-on position with regard to X, her power of estimating the speed of the latter continually decreases, and as the safety of the turn to cross the bow of X depends on the right estimate of her speed, the less the original crossing angle is, the greater will be Y's uncertainty and risk in attempting to cross the path of X.

Another point very necessary to note is the small comparative gain by the use of the helm in crossing the bow of another ship. Y in turning over the curve YY^1b has used five ships' lengths in time, and is not yet across the bows of X. Five ships' lengths in time would, under a steady helm, have taken her beyond the collision point O just before X reached it.

If we again take Y and move her round towards X, carrying the positions Y^1, Y^2, Y^3 round with her as before, we shall soon reach a condition in which neither turn will be dangerous, as both will take her short of the path of X. But when we have reached this point, it is still evident that if Y turns *from* X she will be wrong, because such a turn will never allow her to resume her original course. It will ultimately take her to the same course as X is steering, and she must then take some further step to let X pass her, whereas if she turns *towards* X she is taking the speediest and most convenient step towards the resumption of her original course in safety.

Still moving Y round towards X we see that the above reasoning holds. If Y is ever going to resume her original course, she must do

it by passing under X's stern; and the sooner she turns to do so, the sooner will the original course be resumed in safety.

Thus we see that when two steamers are crossing at an equal distance in space from the collision point, *it is always either dangerous or inconvenient for the giving-way ship to attempt to cross the bows of the other.* It may be further stated that as about one-half of all risks of collision arise when the crossing angle *Yoa* is between 45° and 0°, it is proportionately more dangerous than inconvenient.

But those who are, perhaps, partly aware of the points now stated, appear to have still in their minds some idea that the case will differ when the distances in space between the ships and the collision point differ. Let us for a moment pause to examine such a case. Suppose X to be twice as far in *space* from the collision point as Y. That will place her at X^2. Here there are crossing ships, but not risk of collision, unless the speed of X be nearly double that of Y. It still remains safe, and not very inconvenient for Y to make the turn towards X until she brings her on her port bow. The amount of danger due to the contrary movement will depend still, as before, on the relative speed of X. If she has twice the speed of Y, then the case is simply that a collision is certain at Y^1, for X will then be a ship's length a-head of the position assigned to her at X^1. If the speed of X and Y were originally equal, Y might save herself the trouble of altering course at all, as there is no original risk of collision.

If, on the other hand, we left X where we originally placed her, and removed Y, say twice as far from the collision point, it is evident that neither turn on Y's part can be said to be dangerous, but that the turn *from* X must always be inconvenient, inasmuch as it places the chance of resuming her original course further off.

Let us now suppose that X and Y are sailing ships close-hauled on opposite tacks, with the wind, as shown by the arrow. Y as being on the port tack, is by law the ship to keep out of the way of the other. Now, we have seen that of the four curves open to the steamer, one of them, namely, YY^1b, is not open to the close-hauled sailing ship. We see, however, that the curve *Ye* could be got without much difficulty. Otherwise the case of the close-hauled ships X and Y is just the same as if they were steamers, and it becomes evident that all the arguments in favour of the turn *towards* X, and all those against the turn *from* her apply with double force, as Y cannot maintain her normal speed in luffing. But as Y in luffing into the position Y^2 by way of avoiding X, has deprived herself of all power of locomotion, she has committed a still graver error than the steamer. On the other hand, Y, if she kept away to clear X, would not only run no risk if X did her part of the performance, but would keep herself under control and ready for all eventualities.

The crossing angle of X and Y, as sailing ships, when the wind is as given, cannot be greater than in the figure; but if it be less, Y, as free on the port tack, is still the giving-way ship; and as we have already seen, she approaches more and more nearly to the condition of a steamer deprived of the power of stopping and reversing, as she becomes more and more free, until she is exactly in that condition

when before the wind. But if she is in any position between Y and the end-on position to X, she will obey the same law, and be bound by the same reasoning as we have seen applied to the steamer. That is to say, that whatever we see to uphold or condemn in the general case of X and Y considered as steamers, we must more strongly uphold and condemn in the case of sailing ships where X is close-hauled on the starboard tack, and Y is on the port tack.

Now, in all these cases, which really cover the vast majority of recorded collisions, we find that a movement of Y, tending to cross the bows of X, must be expected to lead to collision, and that a contrary movement, tending to turn short of the original path of X, must be expected to avoid collision. We shall see, on appeal to the recorded facts of collision, that this is not only theoretically but actually true. The movement typified by the curve YY^1b, does in fact very often precede collision, and the movement typified by Yfd does in fact very seldom accompany collision.

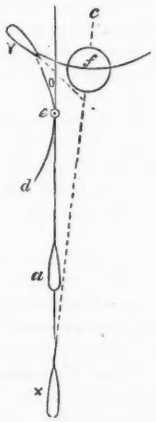
But my nautical hearers will, at this point, be inclined to say that I am using a steam hammer to crack walnuts—that we are all agreed as to the danger of crossing the bows of another ship. My answer is, that *we are not all agreed.* There is no sufficient notion abroad of the danger of this course; and neither the Courts, nor the official authorities, nor the seamen themselves, admit the relative safety and danger of the two turns. We shall appeal to each of these in succession for a confirmation of my statement.

I cannot detain you here to consider other cases, more than just to point out that the same conditions govern them. If, for instance, the wind were in Fig. 2 opposite to where I have placed it, then both ships would be equally free, and equally like steamers deprived of the power of stopping. The difference would be that X would become the ship to give way, and Y would become the ship to keep her course; but what we have learnt as to the proper and improper movements of Y becomes equally cogent as to the proper and improper movements of X. Starboard helm and the turn *towards* the holding-on ship is equally to be recommended to X now, as port helm was to Y when it was *her* duty to give way.

There is but one loophole of escape that I know of from these arguments. Suppose Y, at night, to be so near the collision point O that her turn under port helm must inevitably coincide with or cross the path of X, how can it be recommended that she should turn towards X as a measure of safety? Let us examine this case with the aid of a new diagram, Fig. 3. Here we have Y within half a ship's length of the collision point, so near the path of X, that when the crossing angle is four points, the curve Y describes in turning towards X will coincide with that path. The result of such a turn undoubtedly is to bring the collision point nearer to X, and so far to increase whatever risk of collision there was originally. I must impress on you that the real increase of risk is very much smaller than it appears in this statement, as I shall presently show; but it may stand for the present that there is an increase. The question arises as to what was the original risk? Where, in fact, ought we to

place X in order to make a fair comparison between Figs. 2 and 3? We are, in all these cases, dealing with the law, and we are, therefore, bound to place the ships far enough apart to make it pretty certain that X will keep her course. In Fig. 2 we placed them more than seven lengths apart, and we cannot place them nearer in Fig. 3 with any consistency. This will place X where she is represented to be in the figure. If we were to place her at *a*, the same distance as she was from the collision point in Fig. 2, we should certainly bring in the element of a closer proximity, and a doubt as to whether it was not, in any case, dangerous for X to keep her course. X being where she is, there is no original risk of collision with Y, unless X's speed be more than four times as great as that of Y, a state of things not often to be expected. If Y turns along the curve Y*d*, she will not only

FIG. 3.



advance the collision point in space, but will also retard it in time. It will take her about $2\frac{1}{2}$ lengths in time, to get end-on to X, and by that time the stem of X will be at *a*, if the original speeds were equal. That is to say, there will be no real risk of collision in any case unless the speed of X be double that of Y. But in the whole of this last investigation we are assuming some very improbable circumstances. In the day-time, it is in the highest degree improbable that Y should assume a risk of collision in such a case as that given in Fig. 3. At night, she would, in my view, be right in assuming it and acting thereon. She would see the red light of X on her starboard bow, and for all she could tell, X might be steering towards *c* and not towards O, in which case, as we have seen, Y would be running into the maximum danger if she turned *from* the red light, bringing it more on her bow. But when we allow that there is a danger for Y in turning along the curve Y*d*, supposing X, as we have placed her, steer-

ing towards O, we assume that Y is going to turn on so accurately measured a curve that she will neither cross X's path in the smallest degree, nor turn short of it by more than a distance equal to her own beam. That is to say, that practically, the risk of collision at the point *e* is measured by a space not commonly exceeding fifty feet! But we have already allowed Y a certain power of diminishing the radius of her arc by the stoppage and reversal of her engines as a steamer, or by throwing all aback as a sailing ship close-hauled; and on the other hand, she can always increase the radius of her arc by righting or easing the helm, so that it is very difficult to confine her to this fifty feet, which is necessary to make a collision at the point *e*.

But it may still be urged that Y may either be still nearer the collision point, or may turn on a larger arc than I have allowed in Fig. 3. In this case Y's curve, Y*d*, will cross the path of X; how, then, it may be asked, can I recommend such a movement? The answer is, that the moment Y has crossed the path of X she is free to resume her course, and is no longer bound by any law. In the day-time this crossing is made apparent to her by the masts of X appearing in line, and at night by the appearance of her *green* light.

These remarks conclude a summary of the facts concerning the general case of crossing ships when the distance between them is great enough to make it safe for X to continue her course under the legal direction; and it is pretty plain that the right movement for the giving-way ship, in all such cases, *without any exception*, is to turn *towards* the holding-on ship.

But if we teach so distinct a doctrine when the distance between the ships is great, and when X will naturally keep her course, it is quite certain that our teaching—whether it be right or wrong—will be used when the distances are so small as to make an "immediate "danger," and to relieve X from all obligation to keep her course. It will also inevitably follow that X, relieved from the obligation to keep her course, will adhere to the general teachings, and will turn towards Y. Should I not shrink from propounding dicta so terrible as that which will lead ships in all cases of *immediate danger* to turn towards each other? I opened my paper by condemning the exploded doctrine that it was safe to turn to the right when in doubt; am I not stultifying myself by my present recommendation?

We shall see, I think, that I am neither stultifying myself, nor giving anything but the soundest advice when I say that even in ordinary cases of doubt, and certainly in all cases of crossing with dangerous proximity, ships should turn towards each other as the safest course. My doctrine, in fact, leads towards teaching that *it is practically safe to direct all ships to give way to all others*, though I do not think it should be pressed to that issue.

A modification of Fig. 3 will give us a very fair basis on which to place the first element of the discussion. In Fig. 3 we saw that Y—especially at night—could have no certainty whether X was steering towards *e* or towards *c*, but when Y reached the point *e*, though she would have increased the risk of collision by bringing the collision

point so much nearer in space to X, and by retarding her own chances of clearing the path of the latter, yet that the risk of collision was limited to a space equal to her own beam. If X was steering to a point only 50 or 60 feet right or left of *e*, there would be no collision even supposing she had a speed which would bring her to the level of *e*, just as Y had reached the same level. The two ships would in short pass each other in safety on parallel courses near the point *e*. But on the other hand, supposing Y made what I now assert to be the wrong movement under starboard helm, that X was steering nearly for the point *c* instead of for *e*, and at such speed as would bring her to *f*, nearly at the same time as Y, then we should have Y making a risk which was measured by her *length* at the point *f*.

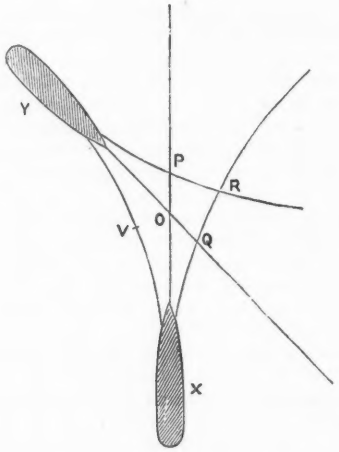
This is a fundamental principle in avoiding collision of which we shall have ample proof when we appeal to the recorded facts, and it may be stated in general terms thus: When the crossing angle is less than a right angle, all turns *towards* the crossing ships tend to decrease the risk of collision until the minimum, measured by the *beam*, is arrived at; but all turns *from* the crossing ship tend to increase the risk of collision until the maximum, measured by the *length*, is reached. As modern ships are commonly six, and sometimes ten times, as long as they are broad, we can say bluntly, that all turns *from* the crossing ship involve from six to ten times the risk due to the opposite movement. These relative risks are consequently well represented by the circles in Fig. 3; at *f*, where the risk is the maximum; and at *e*, where it is at a minimum.

But many persons will be ready to say that I am not taking into account the increased violence of the blow at *e* compared with that at *f*. The desire to mitigate the violence of the end-on, or nearly end-on, blow at *e*, and the assumption that it will be less destructive at *f*, is a very fruitful cause of collision; great numbers of these accidents would be avoided altogether if seamen were less pertinacious in their supposed endeavours "to ease the blow." But the fact is that you cannot have a more destructive collision than that probable at *f*, where either X runs stem on to the broadside of Y, or Y runs stem on to the broadside of X. This in fact appears to be the only kind of blow which actually sinks ships, which may be explained by remembering that the strongest part of one ship is brought into contact with the weakest part of the other. But in the nearly end-on blow, the chances are many hundreds to one that the bluff of one bow will take the bluff of the other, and that no fatal damage will happen to either ship.

These considerations are such as now govern all naval forces when arranging the tactics of avoiding the adversary's ram; it can hardly be argued that they are inapplicable to the tactics of avoiding collision in peace, because in war, all we wish to avoid is allowing the enemy to strike our broadside with his stem: we should be very glad indeed to return the compliment. But in peace, we are quite as anxious to avoid touching our friend's broadside with our own stem, as we are to avoid offering our own broadside to the destructive powers of his stem.

This brings us to the last part of to-day's investigation. We have seen how great is the relative risk of the turn *from* a crossing ship when compared with the turn *towards* her, in all the ordinary cases of crossing, when the angle is between 90° and 0°, and when the holding-on ship may be expected to keep her course. We have now to see how it will be when the distances apart are so small that the holding-on ship is free of the law, and may be expected, under the teaching which I wish to enforce, to turn towards the giving-way ship—each in fact turning towards the other.

FIG. 4.



Refer, therefore, to Fig. 4, where the crossing angle is still 45°, but the ships are so close as to be but half a length from the collision point, and only one length apart. This is a case of the most imminent danger, where it is perfectly certain that under the present law and teaching, neither ship can calculate on any particular movement on the part of the other. If nothing is done by either ship there will be collision at O. If Y turns *from* X, and X does nothing, there will be collision at P. If X turns *from* Y and Y does nothing, there will be collision at Q. If each turns *from* the other, there will be collision at R. All these four collisions will be of the worst kind, or blows approaching the right angle. But if Y turns *towards* X, and X does nothing, there will be no collision. If X turns *towards* Y and Y does nothing, there will be no collision. Finally, if each turns towards the other, there may be collision at V.

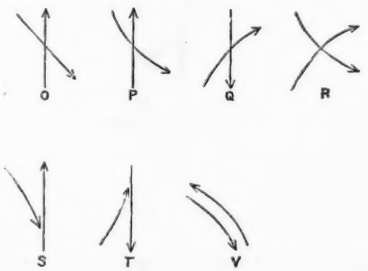
Whatever be the risk of my teaching, it is to be found at this point V; let us, therefore, put the risk to the test. It is first of all evidently at a minimum, as each ship can only present the breadth of her beam as a target to the other, while any alternative movement

offers a target approaching to the full length of either ship. Next it is evident from an inspection of the diagram, that unless X and Y have the same speed, the same turning powers, and are very nearly in the exact positions I have placed them, there will not be a collision at V. For if we move X a single breadth to the right of her position, her arc will fall that much outside the arc of Y. If we place her a single breadth to the left, her arc will fall that much inside the arc of Y. If we advance her by a very short distance, or retire her by a very short distance, her arc will equally fall outside or inside that of Y, and so make a collision all but impossible. So that it is only under very extraordinary conditions that there can be a collision at V, while at O, P, Q, and R, the conditions may be commonly and easily fulfilled.

But there is yet another element of safety connected with the inward turn, which is more than absent in the outward turn. It is extremely unlikely that X and Y should turn towards each other simultaneously: if one moves but a few seconds before the other, she will disclose her movement at night time by changing the colour of her lights, and at once relieve the other from all necessity to turn further. But if the two ships turn *from* each other, neither discloses the other's movement by any change in the colour of the light, and it is only when escape is hopeless that the error is ascertained. Moreover in the inward turn, whichever ship happens to be on the outer arc has full power to avoid a collision by righting the helm. But if X and Y find themselves turning towards R with the outward turn, neither has any power of avoiding disaster, and collision becomes absolutely certain.

Now, looking at all the theoretical bases we have brought forward, and at the inferences to be drawn from them, we can see that for ordinary crossing ships there are seven kinds of collision possible, which I have expressed on Fig. 5, and named O, P, Q, R, S, T, and V colli-

FIG. 5.



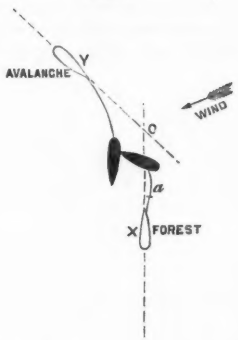
sions. In the O collision, neither ship does anything. In the P collision, one ship does nothing, and the other makes a collision with the outward turn under starboard helm. In the Q collision, one ship does nothing, and the other makes collision with the outward turn under port helm. In the R collision, both ships make collision under the

outward turn—the turn *from* each other. In the S collision, one ship does nothing, and the other makes collision with the inward turn under port helm. In the T collision, one ship does nothing, and the other makes collision with the inward turn under starboard helm. In the V collision, both ships make collision under the inward turn.

If my theoretical teaching has any practical value, we ought to find P, Q, and R collisions extremely common, and S, T, and V collisions extremely rare; and if this is so, then we must either say that the inward turns are never used, or that my teaching is founded on the "True Bases for a Rule of the Road at Sea." I have, it will be observed, omitted those cases where one ship makes the outward, and the other the inward turn; that is, where both starboard, or both port. This is done on the ground that, practically, these come under the P and Q cases. Looking at Fig. 4, it will be seen that the cases where Y makes the inward turn, and X would avoid a collision by making the outward turn, while she would make one by continuing her course, must be very rare; and the ships must be then so close together that there cannot be time to use either helm with effect.

Before, however, we proceed with the appeal to the recorded facts of collision to ascertain whether the theory is borne out in practice, I must do what I have promised, and show that "*neither the Courts, "nor the official authorities, nor seamen themselves, admit the relative "safety and danger*" of the movements I have contrasted. I need not go back to the port helm days which clearly ignored all differences; and the most recent utterances will certainly be the best to appeal to.

FIG. 6.



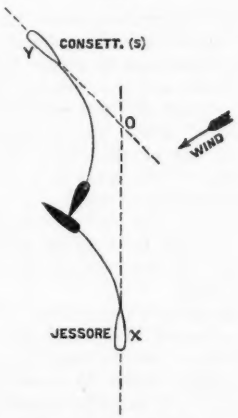
Taking first the Courts, we have a memorable and melancholy instance, complete in all respects, in the judgment of the Wreck Commissioners' Court on the "Forest" and "Avalanche" disaster. The approach of the ships is exactly represented by the positions given to X and Y in Fig. 2, and now transferred. The "Forest," X, Fig. 6, was under easy sail, close-hauled on the starboard tack. Y, the "Avalanche," was under more sail, close-hauled on the port tack.

Y, the "Avalanche," was late in moving, but in the end took the inward turn, or, in my view, the proper turn. X, the "Forest," alarmed at the near approach of Y's green light on his port bow, threw himself in the wind at *a*, or, in my view, took the wrong turn. Partly by this movement, and partly by Y's turning, X got to the safe or port bow of Y. But when he got there, the ship was not under command; she fell off, and with her port bow struck the "Avalanche" on her port side aft. Both ships sank, and caused a loss of about 100 lives.

I suppose there can be few people better acquainted with the ruling of the Courts than Mr. Rothery, the Commissioner of Wreck, who, with nautical assessors, tried this case; and when I quote his judgment, I believe I quote the most correct enunciation of the law to be had. He said, "The 'Avalanche' (Y) *had the option either of going "ahead or astern of the 'Forest,' as she thought fit;* but whichever she "elected to do, it was her duty to do it in sufficient time." This was as to the "Avalanche;" as to the "Forest" he said: "We are not dis- "posed to blame him for ordering the helmsman to luff when he saw "the 'Avalanche's' green light, *for it was his duty to do so, to see that "he was close to the wind.*"

Here we have a clear absence of distinction between the right and the wrong turns for the giving-way ship, and we have something approaching to commendation for what I call the wrong turn on the part of the holding-on ship in the presence of an immediate danger.

FIG. 7.



To complete this latter point, I shall take another recent and very remarkable case, the "Jessore" and the "Consett." The "Jessore" was a large sailing ship, close-hauled on the starboard tack—as X in Fig. 7—and she saw the green light of a steamer—the "Consett"—

on her port bow, as Y in the figure. Knowing that every moment things continued thus, the danger was increasing, and seeing that the "Consett" was not apparently going to do her duty by giving way in time, the "Jessore" put her helm a-starboard, and brought the green light of the "Consett" opposite to her own green light, and therefore into safety. But just before this time the "Consett" became aware of her own danger, and put her helm to port. Before she had much altered her course, she saw the "Jessore's" red light disappear, and the green light open on her starboard or safe bow. This was a natural signal to her, *at least to let her wheel go;* for it then became certain that nothing but a continuance of port helm could make a collision. However she not only kept her helm a-port, but those in the "Jessore" were so ignorant of the turning powers of ships, that when they saw the "Consett's" green light change to red on their starboard side, they actually hailed her to keep her helm a-port—that is, to persist in the wrong movement she was making. The result was that the "Jessore" was struck about the starboard main rigging, and sank.

The Liverpool Court, which held an official inquiry into this case, condemned the "Jessore" for starboarding, but did not condemn the "Consett" for persisting in port helm after it had become clearly dangerous.

These two official utterances make a complete case as to the judgment of the Courts on what is right for the giving-way ship, under the law, and also as to what is wrong for the holding-on ship when relieved of the duty of keeping her course by the presence of immediate danger. It is clear that the law is entirely at variance with the theoretical teachings.

Next, as to the official interpretation, we have equally clear utterances. In a series of diagrams and explanations in reference to the rule of the road for steamers, issued under the sanction of the Admiralty, the Board of Trade, and the Trinity House, the case is given of a steamer, Y, Fig. 2, seeing the red light of another steamer, X, anywhere on her starboard bow. The interpretation put upon the direction to her to "keep out of the way of the ship showing the red "light" stands as follows:—"*She must get out of the way by stopping,* "*or going ahead, or starboarding, or porting, or going astern, as the cir-* "*cumstances of the case may require.*" Though this only goes to the case of steamers, yet it must be held to apply fully to the case of free ships under sail, and by analogy, as we have seen, to the close-hauled ship on the port tack.

The very large and important Committee which recently sat at the Board of Trade fully endorsed this teaching, asserting that "there "may be cases in which one steamer may, in getting out of the way, "find it the best and safest course to cross the bows of the other "from port to starboard." It must be recollected that this does not in the least refer to cases of "immediate danger," but to the ordinary case of a steamer seeing the red light of another steamer on her starboard bow, and to the proper steps to be taken to "keep out of the "way."

Thus far for the Courts and the official interpretation. I shall give

but one illustration to show that we seamen—even we who have made an intelligent study of the matter—have not yet seen it in its true light.

Few more useful hints on this great question have been given than those contained in Captain (now Rear-Admiral) de Horsey's "Practical "Directions for complying with the Board of Trade Regulations for "Preventing Collisions at Sea." In his hints to ships under sail, close-hauled on the port tack, crossing the path of the ship close-hauled on the starboard tack, our ancient and invariable teaching in the Navy does not mislead the gallant Admiral. His advice is distinct—"Bear away." But when he speaks to the free ship and to the steamer—being the giving-way ship—and crossing the path of a holding-on ship, his advice follows the modern teaching. He tells you indifferently to "alter course several points to starboard or port to "assist in altering the bearing" of the approaching ship.

So you see that we are quite out of the fog of vagueness and uncertainty in this matter, and the issue I raise is very distinct. I assert that in all cases of crossing ships under the law there is for the giving-way ship a right or safe movement, and a wrong or unsafe movement. The Courts, the Authorities, and one at least of our leading Seamen, assert that there is no difference in the movements, and that seamen must all be taught that each is equally open to them. It is most important to settle which of the two parties has the truth on their side, as it is perfectly evident that if I am right, then we are all allowing ships to destroy each other for want of a word of warning.

I have made my appeal first to the recorded experiments relating to the manœuvring of ships. The theory cannot be denied, for all the Navies of the world admit it. It can, however, be denied that the theory is of practical value. I therefore proceed to show that this idea is untenable, and I shall do so by appealing directly to the recorded facts of collision.

If theory is of practical application, we shall have, as I before mentioned, a great majority of P, Q, and R collisions, or those which involve the wrong movements; and a small minority of S, T, and V collisions, which do not involve the wrong movements. We must expect to find *some* of these cases, because, after all, at close quarters the risk of a right movement only diminishes from the length of the ship to her breadth, and not to zero; and there will always be cases where collision was inevitable, no matter what movements were made. We must also expect to find cases like that of the "Consett" and "Jessore," so long as mistaken notions are abroad, and it may be argued that no teaching will prevent such cases entirely.

But if all these things are found on an examination of a sufficient number of collision cases to get fair averages—then I consider my case is proved, and that not a moment should be lost in abandoning the teaching thus shown to be false.

I take first the 202 collision cases tried in the Admiralty Courts between 1854 and 1864, published in "The Law of Port Helm," where I find 63 clear crossing cases. Out of these 1 was an O case: 2 were P cases: 24 were Q cases: 24 were R cases: 7 were S cases:

3 were T cases: and 2 were V cases. That is, there were, to make these collisions, no less than 74 wrong movements to 14 right ones. The preponderance of Q cases over P cases—12 times as many—is, of course, due to the then law of port helm. At the present time these cases appear more nearly equal in number. Of the 10 S and T cases, there were only 4 in which each ship saw the other at any distance. In 5 cases, the ship making the right movement did not see the other until close to, while, in one case, the ship moving does not say how far off she saw the other. Of the 2 V cases, one ship making a right movement did not see the other until close to.

So that we have first, a very large majority of wrong movements; and some grounds for supposing that right movements, when made, were made too late. As this table of collisions was drawn up without reference to the present enquiry, there is no note of the damage, nor of the mode of collision, which might possibly place some of the V cases side by side with the "Jessore" case.

Captain Brent has, with the kind permission of Mr. Rothery, drawn up a second table, similar to the one just treated of, which comprises 122 cases in all, which were tried in the Admiralty Court between 1864 and 1869. This table gives the following results:—58 cases where either each ship used the same helm, thus causing the wrong and right movements to neutralise each other: or where the statements of each side are irreconcilable: or where the whole thing is doubtful. 7 overtaking cases, with which we do not deal to-day. 6 cases of parallel courses, where the use of port helm made the collision. There remain 51 ordinary crossing cases where either no movements, or right, or wrong movements were made.

There were of these, 4 O cases, where neither ships did anything: 6 P cases: 21 Q cases: 6 R cases: 5 S cases: 1 T case: and 8 V cases. That is to say, that this second collection shows 39 wrong movements preceding collision to 22 right movements.

Taking the two lists together as a collection of 109 ordinary crossing cases, we get 113 wrong movements to only 36 right ones.

In order to secure myself against a possible mistake in these very remarkable figures, I have appealed to a different sort of record. Whenever ships get into collision near the coast of England, they make independent depositions before the nearest Receiver of Wreck, and these depositions are published in the *Shipping Gazette*. They are exceedingly valuable and instructive, and I have examined and classified all those published between the 1st August, 1877, and the 15th of last January, about 100 in number. As we have usually only one side of the case in these depositions, we cannot deal with them as I have done with the complete cases, but they give generally the same results. There is a large preponderance of wrong movements ingenuously deposed to, of which the following, taken from the *Shipping Gazette* of the 10th of January last, is a fair illustration.

"About fifteen minutes before the collision, I saw the mast-head "light of a steamer on my starboard bow about four points. I took "his bearing. . . . . About six or seven minutes afterwards I "saw his red light. I was then running with the wind aft. I kept

" my course, but the steamer appeared to be nearing me on my star-
" board side, and seemed to be going to cross my bow. He came on
" within 100 yards of me, and when I saw that he would run into my
" vessel, I at once put my helm *hard a-starboard*, it being my only
" chance in the then circumstances to avoid the collision, but it did
" not quite succeed, for he came on and took me a sliding blow on my
" starboard bow."

Freely translated, this means, "I saw that the steamer had elected " (according to law) to pass ahead of me, I took care to frustrate her " movement by myself trying to pass ahead of her."

These depositions, besides confirming the result of the complete cases by abundance of similar depositions to that given above, show also that whenever a right movement precedes collision, it is either frustrated by the wrong movement of the other, or is not taken till too late. The remarkable fact is also disclosed that right movements, when taken at the last moment, do not make bad collisions. Sometimes the damage is confined to spars, at others the bluff of one bow takes the bluff of another. It does not appear that ships are often sunk by right movements.

Upon the whole, wherever we turn, and whatever records we take up, we always find the strongest condemnation given to wrong movements, and the greatest approval given to the theoretically right movements by the facts of the case.

I have no doubt but that you have observed an apparently weak spot in my statement of the results of cases. In the list recently prepared by Captain Brent, there are 8 V cases to only 6 R cases; and this would seem to say that, after all, things are *not quite* as I represent them. But all this idea falls through when we examine the cases. In four of the eight cases the ships were on board of one another before any movement was made, and the remaining four were cases similar to, but worse than the "Jessore" case. The ships on the outer circle in three cases did not turn until after they had had distinct signals by the change of lights in the other *not* to turn. *After* the ships had, by the movement of one of them, got to parallel courses and safety, the other ship went about to make, first a risk, and then a collision by a perfectly gratuitous wrong movement.

How do these wrong movements in such cases arise? To me it is very plain. If seamen are generally taught that being in giving-way ships, it is indifferent whether they port or starboard to either coloured light on either bow, when there are no circumstances to compel one movement more than another, how are we to prevent them from carrying that doctrine into close quarters? I have read you an ordinary deposition on that head—how are we to teach such a deponent that he is wrong to do such a thing when close to, if we teach him that he may do it when far off? And how are we to draw the fine distinction as to the direction in which coloured lights are seen? If it is right for the giving-way ship to *starboard* when a *red* light appears on her *starboard* bow, why should it not be right to starboard when the red light is ahead, or even a little on the port bow? It is not easy to make fine distinctions on this head, especially in times of proximate danger. My

teaching, on the other hand, would tend to these very simple dicta—that *the appearance of a green light was always a signal* NOT *to port*, and that *the appearance of a red light was always a signal* NOT *to starboard*, and if any faith whatever can be placed in the records of these cases, and any truth in the theoretical data confirming them, such teaching should enormously reduce the numbers of collisions.

I pointed out that there was but one escape from the teaching of the records: that is, to assert that the reason why the so-called right movements so seldom preceded collision was to be found in the fact that such movements were so seldom made. I must conclude by withdrawing this straw from the drowning grasp of false doctrine.

The Q and the S cases both involve port helm only. In the Q cases that helm is in my view wrong; in the S cases it is right. It is quite certain that throughout the whole period over which these cases extend, port helm was used indifferently; but when it was wrong it made 45 cases of collision, and when it was right it only made 12.

Mr. STIRLING LACON: Gentlemen, such is the rule of the road at sea! If, instead of this room being filled with its present enlightened audience, it had been occupied by the persons to whom the rule of the road at sea especially applies, namely, our seafaring population—in some respects perhaps the most illiterate of our people—would they have been able to understand, from what we have heard, what the rule of the road really is? Captain Colomb is a representative man, and I suppose, therefore, he represents the views of the Admiralty. (Captain COLOMB: Not at all.) A pamphlet on the rule of the road at sea, just published, has been kindly given to me by Mr. Gray, of the Board of Trade, and this pamphlet also puts the question in a state as difficult to be understood as, I fear, it must appear to you after what you have heard. But, gentlemen, "the rule "of the road at sea" is not a question solely for the English Admiralty or for the Board of Trade: it is an international question; and before I show you how simple a matter it is—as simple as two people walking on the pavement, instead of the complicated question which it has become—I must ask you to favour me with your attention while I tell you the view that is taken on this subject in the various maritime countries of Europe and America. I have been twice in Norway, where we held a Conference, which lasted for an hour and a half. I have been twice in Stockholm, and the last time I was there I was exceedingly gratified to find that every little scrap of paper and every pencil-mark relating to the subject which I had left on my previous visit had been stowed away in a pigeon-hole at the Admiralty. After this I went on to St. Petersburg, about four years ago. Here Lord Augustus Loftus kindly came to my rescue, and introduced me formally to the authorities, and two days afterwards sent me to the palace with a card, "Monsieur Lacon, presenté par l'Ambassadeur d'Angleterre." At the end of thirteen days I had a conference with the authorities on the subject of the rule of the road, which was most satisfactory. I then went to Copenhagen, and the Minister of Marine asked me how long I could remain. I told him I had lost so much time in St. Petersburg that I had very little to spare. He appointed a committee to meet the next day, consisting of a Commodore and seven Captains, and a long conference ensued. Of course I was not in a position to ask them what they thought of this question; but an old Captain whispered in my ear, and said, "You have convinced "me." I have twice had meetings at Hamburg with merchant captains. I then went to Berlin, a perfect stranger, and was granted an audience at the Admiralty. I went before three Admirals and six Captains, and addressed them for an hour and a half. At the Hague the result was the same: and again at Ostend, where we had a conference by order of the Government. In France, the *Revue Maritime et Coloniale*, published under the authority of the French Minister of Marine, states that "Mr. Lacon has left nothing to be desired; his rules are short and concise." In Vienna I have reason to know that they look upon these rules most favourably.

The United States of America four years ago intimated from Washington, "You have "sent quite enough to enable people here to judge of the merits of the case." And the Minister of Marine at Rio has sent me his thanks through the Brazilian Minister in London. Only last Friday I was with the Italian authorities at Spezzia, and they are agreed. What upon? They are agreed upon this: that the old custom and practice of the sea which had existed in every country for centuries, ought never to have been disturbed; and, instead of going to anything new, as proposed by Captain Colomb——

Captain COLOMB: I do not propose anything new.

Mr. LACON: Instead of going to anything new, we ought to return to that which was in existence previously to 1862. Previously to 1862 there was no written law of the sea; and the countries I have now mentioned to you, wish to go back to what had existed previously for centuries.

In considering the question, you must remember that sailing vessels and steam vessels are totally different things. This rule, the custom and practice of the sea (in words) is all that is required for sailing ships, and everything else might be cancelled, viz.:

"A sailing ship on the port tack shall give way to a sailing ship on the star-
"board tack; a sailing ship with the wind free shall give way to a sailing ship
"close-hauled. Where two sailing ships each with the wind free meet on opposite
"courses, the ship which has the wind on her port-side shall pass to leeward."

But, as I have said, sailing vessels and steam vessels are two totally different things. Sailing vessels are actuated by the wind, over which you have no control. Steam vessels are actuated by steam, over which you have every control. The next diagram shows all that is required for steam-ships:—

A steam-ship having another—

"Ahead ..... shall go to the right;
"On her left side .... shall go to the right;
"On her right side .. shall go to the left and stop."

Why do I make use of the expressions right and left? In the earliest days of steam, Norway and Sweden, in consequence of the intricacy of their navigation, were obliged to adopt the practice whereby the direction of the ship's head and the word of command, "starboard" or "port," should correspond; but in England the terms "port" and "starboard" apply to the helm, and starboard in Norway is not starboard in England. In England starboard is port, and port is starboard. Twenty-five years ago the French followed the present practice of England, and a French man-of-war coming out of Christiansand, with a Norwegian pilot, in consequence of a misunderstanding of the steering order, was dashed at full speed upon the rocks. The French, after this, issued an order to their Navy to exercise in this matter care and discretion, and so the thing ran on for fifteen years; and a French Admiral told me he never took a pilot after that time without first asking him, how he understood the expressions "port" and "starboard?" After I had made a stir in the Scandinavian countries about nine years ago, the French issued an order to their Navy, that starboard should mean that the ship's head should go to starboard, and that the term should not apply to the helm; but although they issued that order to their Navy, they did not issue it to their Merchant Service until four years afterwards; therefore, you had in the same country, the Navy, in obedience to the same order, going in one direction, and the merchant ships in another. I discovered this complication about ten years since. A ship called the "Leichardt" was lying at anchor at the Nore; a steamer bound out to Norway, with a crew partly English, partly Norwegian, came down the river, nothing else being near. The pilot and Captain of the steamer were on the bridge; it was about a quarter to six on a November afternoon. They had a steering telegraph lamp showing red, green, and white, and they turned on green. Now green means starboard, and the ship went to starboard, and ran into and sank the ship lying at anchor. The pilot and the Captain intended to starboard the helm, and to go to port; and because the ship's head went to the right when they intended it to go to the left, the pilot jumped to the conclusion that the Captain had altered the telegraph lamp, so he knocked the Captain down, and the Captain rushed down into the cabin and entered in the log that the pilot

was drunk. An enquiry was held at Greenwich, and the man at the helm (at the stern) swore through thick and thin that he starboarded; but nobody had the sense to ask him, What did he starboard? Did he starboard the ship's head or did he starboard the ship's helm? But besides this question of the verbal order there is also the question of pointing or motion. Last June, on my way to Sheerness, I watched the Captain of the ship, and noticed that when he pointed, the ship's head went in the *same* direction. A week afterwards I returned from Ramsgate, and noticed when the Captain pointed, that the ship's head went in a *contrary* direction. I expressed my great surprise at this, and was told that the custom at sea and in the river was different. Now I wish to apply what I have told you to the collision between the "Alberta" and the "Mistletoe." You will recollect that the "Mistletoe" was going over from Portsmouth to Ryde. The "Alberta" came down from Cowes. The quartermaster of the "Alberta" gave this evidence. "The order was given "by word of mouth, the usual custom is by motion." Starboard by word of mouth is to go to the left, and starboard by motion is to go to the right. The Officer in charge stood upon the bridge of the "Alberta," and probably said over his shoulder, "starboard," in order to pass under the stern of the "Mistletoe," but instead of going under the stern of the "Mistletoe" the head of the "Alberta" began to go to starboard. As a proof of this we have the evidence of the "Mistletoe" luffing to get out of the way, but the poor Captain of the "Mistletoe" was drowned, and was not able to tell us his story. The head of the "Alberta" going off to the right, the Officer in charge would say "Starboard, Sir, d——n it, did I not tell you to star- "board the helm." "No, sir, you did not, you told this man to 'starboard.'" And the result was, although the vessel was stopped, the wheel having been reversed, the rudder was powerless, and she drifted helplessly down upon the "Mistletoe," and sank her. That, I believe, is the true story of the "Alberta" and the "Mistletoe." Again you have the case of the "Murillo" and the "Northfleet." Is it not an astounding thing that a vessel lying at anchor should be run into by a steam-ship? There must be some unexplained cause for this. Then there is the case of the "Franconia," and the "Strathclyde." In broad daylight, about 4·15 p.m., the "Franconia," an overtaking ship, suddenly ran into and sank the "Strathclyde," both ships steering almost the same course. On board the "Franconia" there were two pilots, an English pilot and a French pilot. From Grimsby to the South Sand Head Light, the English pilot had charge of the ship, and his order "port" implies, according to the custom and practice of England, that the ship's head shall go to the right. From Dungeness to Havre, the French pilot has charge, and his order "port" implies, according to the decree of the French Government, that the ship's head shall go to the left. During the interregnum, namely between the South Sand Head and Dungeness, the Captain had charge, when the accident happened. There was no steering telegraph on board the "Franconia," and the man at the helm was at the stern, 150 feet from the bridge. There was no evidence how the order was given, whether by word of mouth or by motion. At the Central Criminal Court this state of things was brought to the notice of counsel for the "Franconia," both before and during the trial, but no question was asked in order to elucidate the subject, and a verdict of manslaughter was the result. Now let us test the simplicity of this rule which I have drawn up. "If a ship has another ahead, she shall go to "the right. If she has another on her left side, she shall go to the right; if she "has another on her right side, she shall go to the left and stop." Why? Because if I go to the right, I am entitled to go on, and if another vessel is showing her red light to me, we pass in safety. If she is showing a green light, she is bound to stop and let me pass. In the same way, if I show her a green light and she shows me a red light, she is entitled to pass and I am bound to stop. If she shows a green light to my green light, we pass in safety. Adopt that rule and you may do away with every other rule in existence. By these rules you will get rid of 800 unnecessary words both for sailing ships and steam-ships. There is no other rule necessary except these:—

"A steam-ship, except when towing, shall keep out of the way of a sailing ship.
"Every vessel overtaking another, shall keep out of her way.
"A steam-ship, in a fog, shall go at moderate speed.
"Vessels having been in collision shall assist each other."

That is all that is required. Let me illustrate the application of the rule by what has happened. Her Majesty's ship "Amazon" and the "Osprey" saw each other five miles off, and as the "Amazon's" sails were lifting, young Loveridge, the Sub-Lieutenant and Officer of the watch, starboarded his helm, and shortly afterwards the "Osprey's" light was reported two points on the "Amazon's" starboard bow. The decision of the court-martial, consisting of an Admiral and eight Captains, which sat in this case was, "The collision was caused by a grave error in judgment on the part "of Sub-Lieutenant Loveridge, the Officer of the watch, in putting the helm of the "'Amazon" to starboard instead of to port, when first sighting the light of the "'Osprey' (the vessels being then five miles apart), in contravention of the regulations "for preventing collisions at sea." Sub-Lieutenant Loveridge was cashiered, but recommended to mercy, and the sentence was ordered to be read on board all Her Majesty's ships in commission. Would the sea be navigable if a vessel was not allowed to starboard or port, when another vessel was five miles off? But this young Officer was dismissed the Service for doing that. He having starboarded his helm, and gone to port or to the left, what happened? The "Osprey," seeing the light of the "Amazon," ported, and the vessels came quickly into the position (illustrated by models), the usual position in collisions. What does my rule say? "A vessel having another on her right side, at night showing a green light, shall stop "and let the other pass." Is that not better than to do what was done? Having first of all starboarded, the "Amazon" now suddenly ported her helm, and struck the "Osprey" on the counter, and both ships were sunk; the country losing a fine new ship fully equipped, and having to pay £36,000 damages for the "Osprey," besides the loss of eleven lives! Then again there was the case of the "Surat," carrying the mails, and Her Majesty's ship "Euphrates," in the Red Sea. The "Euphrates" showing a green light went across the bows of the "Surat" at full speed. I say "a vessel having another on her right side, at night showing a green "light, shall stop, and let the other vessel pass," but the Captain of the "Surat" was an experienced, careful man, and rather than risk a collision, HE *stopped*. When he came to England, he made a report to the Peninsular and Oriental Company's Directors of what the Captain of the "Euphrates" had done, and the Captain of Her Majesty's ship "Euphrates" made an apology; but I want something more than an apology, I want to make it law that a vessel having another on her right side, or showing a green light, shall stop and let the other pass. If I am in a ship showing a red light, I am entitled to go on, and the vessel showing a green light is bound to stop and let me pass. In the same way if I show a green light I am bound to stop and let another vessel showing a red light pass. It is as simple as two people walking on the pavement, and yet it has been made a most complicated affair in our blue books and otherwise. What I have pointed out to you is all that is necessary for "the "rule of the road at sea."

Mr. SCOTT RUSSELL, F.R.S.: As a landsman I would rather not intrude any opinions of my own in a meeting where so many sailors are present, the only opinion I could offer being that of a landsman. I will only venture to say, that the very interesting paper we have heard has convinced me, and, I think, has convinced all of you, that the question, what two Captains are to do when they see their ships very near each other, is an awfully difficult and complicated one; and it appears to me, that if, when we came in sight of the other ship, we had got to pass all those diagrams through our heads, and then to ask ourselves, which of all these cases is going to happen, and if we were to say, "Am I to do as O does, or as P does, or as "Q does, or as R, or as S, or as T, or as V?" I think we should do our work a good deal too late. It is plain to me, from the admirably lucid exposition that we have had, that all these things will be done in practice a great deal too late. If rules and legislation are to do anything, I think they must do these two things: first, wipe out all those beautiful diagrams, and principles, and expositions; and, secondly, wipe out all the complicated, beautifully-worded rules of this blue book, for the instruction of men steering ships, out of which I will read you one little passage. The rule, that when a ship meets another she is to keep to the right, contains the plain words of common sense and custom; and now I will give you the words of this charming blue book which I hold in my hand.

The CHAIRMAN: Let me explain to the meeting, that the thick blue book which

Mr. Scott Russell has in his hand does not refer to the rule of the road at sea alone, but it contains the whole law of merchant shipping.

Mr. Scott Russell: All that sailors ought to know; and I hope that nobody will be asked to carry this book about in their heads before they are supposed to be entitled to steer a ship.

Now, I will tell you what this blue book says. The plain common sense words, as I have said, are, "when two ships meet each other each shall keep to the right," but this book says, "whenever any ship, whether a steam or sailing ship, proceeding "in one direction, meets another ship, whether a steam or sailing ship, proceeding "in another direction, so that if both ships were to continue their respective "courses, they would pass so near as to involve any risk of a collision, the helms of "both ships shall be put to port, so as to pass on the port side of each, and this "rule shall be obeyed by all steam-ships and by all sailing ships, whether on the "port or starboard tack, and whether close hauled or not, unless the circumstances "of the case are such as to render a departure from the rule necessary, in order to "avoid immediate danger, and subject, also, to the proviso that due care should be "had to the dangers of navigation, and as regards sailing ships on the starboard "tack close hauled to keep such ships under command." Is that plain common sense? Is not the old rule of the road at sea by custom something infinitely better and more lucid than this long rule? And now let me sum up in three words all I have to say on the subject. Every man knows who is taught, as I was as a boy, to navigate a ship, that in steering a ship we are steering according to our instinct, our common sense, and our custom; but this book, the whole legislation of the Board of Trade, appears to me folly, because it asks a man who is steering a ship, and whose duty is prompt action, to make an infinite number of calculations of probabilities and improbabilities before he performs the simple operation of keeping the ship out of the way of the other ship. For that reason, I beg to say, that I wish to see the whole of the Board of Trade legislation on that subject blotted out. I should like to see short rules even more laconic than Mr. Stirling Lacon's rules put into practice, and I would add to all these rules another, which is a rule of common sense, that "when obeying these rules, or any others, would cause danger or risk "collision, then *break all rules.*"

Mr. Liggins: I learned the rules of the road at sea when a boy in the English Channel, and have taken an interest in them and in their successful working, and have used them in all cases, as far as opportunity has offered, from that time to this, and I came here to-day, with very great anxiety, to learn something new, which might have a tendency to improve the safety of those who "go down to the sea in "ships." But I must say, coupled with the explanation in connection with these diagrams, I feel sadly disappointed, for I am perfectly satisfied that Fig. 2 clearly indicates the advantage of the present rule of the road at sea, that when two steam-ships meet they should each port their helms. If you, for a moment, look at the letter "Y," and suppose she is, at this moment, in the position she is there represented, the letter "X" being the other steam-ship, clearly, if the ship "Y" ports her helm, she makes a curve towards the letter "D"; if, at the same time, the ship X ports her helm, she will make a curve in the opposite direction; it is quite obvious to everybody that those two ships could not possibly come into collision. It is all very well for the gallant Officer to talk about so many ship's lengths apart. We must remember that ships in clear light, when they can tell the number of lengths they are apart, do not come into collision. As a rule, collisions happen on dark nights when the lights are imperfectly seen, or they happen in the day when the fog is thick, so that the ships are not seen at all until they come so close that it becomes a question with both Captains what they will do. Is it not better, under such circumstances as these, that the Captain in each ship should at once know the right thing would be to port his helm? Both ships might possibly do wrong if their position was different to that drawing, but if both ships port their helm under such circumstances as that diagram illustrates, I contend that the safety of each ship, in ninety-nine cases out of a hundred, is thoroughly secured. It is where you leave it optional that difficulties have arisen; and I notice that the rule of the road, as laid down in the law, is pretty clearly enforced, and it is only in exceptional cases that our Courts allow departure from it under any circumstances. Take the case of X and Y,

two sailing ships; clearly, if X, being on the starboard tack, keeps her course, and Y, being on the port tack, ports her helm, she puts herself into the position of the curve of the letter D, and no collision can take place; but if there is to be a hesitation as to whether Y should starboard her helm and go up the curve B or A, then, I think, the collision will be almost certain; in nearly every case it would be so, but if Y ports her helm and keeps away, X, according to rule, will hold her own, and no collision can occur. I have very often in crossing the English Channel, as I have done four times lately in gales of wind, found that captains of the steam-boats on that service, and pilots navigating ships in the Channel, are very averse to any alteration of the rules; and I have noticed that it is not experienced men of that sort who agitate for any change. I am not of opinion, with Mr. Scott Russell, that it would be well to wipe out all that is contained in that book. Who are the authors of these rules and regulations? Not the gentlemen of the Board of Trade alone, but the Elder Brethren of the Trinity House, the Lords of the Admiralty, and their nautical advisers of every grade were consulted; and they have done more than that, they have adopted rules that have been recognised for generations of clever men before us, from the days of Lord Nelson. It is a recent thing, within the last forty years, that there has been so much legislation upon the subject, but the legislation, in my judgment, is simply to enforce the rules that the experience of ages has found to be necessary, and, therefore, we should be very chary indeed of altering them, and the more so for this reason, that foreign countries, the United States, the French Government, the Italians, the Spaniards, the Portuguese, Norwegians and Danes, old seamen and sailors, and other maritime nations, have done us the honour to adopt our rules. I know there is some little difference of opinion as to the rule of starboard helm and port helm, whether the helm of the ship being put to starboard the vessel shall go to port, or whether the ship shall go to starboard in the French service, but, I believe, the rule has been decided, and that they now adopt, in every respect, our mode of expressing our rule. We must be very careful in altering the rule of the road at sea, because, by doing so, we may run the risk of collision with other countries, and it is essential that all nations should have one universal code of regulations, and I thought that was the case at the present time.

Mr. Scott Russell: No.

Mr. Liggins: I certainly was under that impression, but it is a point that ought not to be settled in this room without very serious consideration by those who are largely interested in the safety of ships at sea, and I should be very sorry indeed to see the port-helm a thing of by-gone days.

Captain Colomb: It is gone; there is hardly such a thing known.

Mr. Liggins: I was sailing a match not many years ago in the largest cutter in the world; we met another very large cutter of 185 tons crossing on the port tack, and the vessel on the starboard tack, to avoid collision, gave way and luffed, simply because the vessel on the port tack refused to obey the clearly laid down rule of the road by giving way. Both these vessels would have been sunk some seven or eight miles from the land, and fifty or sixty people would have been drowned, if it had not been that the Captain on the starboard tack, to prevent serious collision, used his judgment; and I believe if an accident had thus occurred, the Courts would have exculpated him for breaking the rule, because it was quite clear the other intended to hold his course against the rule of the road. If he had ported his helm, and got out of the way at the proper time, there would have been no necessity to force the other Captain to break the rule.

Mr. Rothery: I should have had some reluctance in rising to take part in this discussion had not the gallant Chairman called upon me; but as he has done so, it would be uncourteous in me not to say a few words on the subject of the paper which we just heard read. My objections were twofold. I felt that not being a member of your honourable Institution I had really no right to speak at all. But my greatest objection is that which has been so forcibly urged by Mr. Scott Russell, that as a landsman I could really know very little about the matter compared with the many gentlemen whom I see about me. At the same time you may perhaps be, I will not say anxious, but willing to hear what a landsman's views upon the subject are, for as it often happens that those accustomed to travel along a beaten track miss

objects which strike the attention of those to whom the path is new, for a landsman may present the matter in a new light to seamen, who from their greater knowledge would be much more able to draw useful deductions therefrom than he can be. Now whether we do or do not agree with Captain Colomb in the paper he has read to us, I think we must all be very grateful to him for the care and attention which he has paid to the subject—a subject the most important perhaps that can occupy the deliberations of a distinguished society like this. We shall all too, I think, agree that he has treated it with marked ability from this our point of view. And the few observations which I propose to make, and they shall be very few, shall be directed rather to elicit from Captain Colomb explanations upon points which, either owing to my own obtuseness or my want of nautical knowledge and experience, are not quite clear to me. If I rightly understood Captain Colomb, what he told us was this—that ships should generally turn their heads not from one another, but to one another; for instance then, when a vessel sees a red light on her starboard bow as on the plan of the "Avalanche" and "Forest," or a green light on the port bow, the vessel, as I understood, ought to turn her head towards the other.

Captain COLOMB: As she has done.

Mr. ROTHERY: Exactly. Then the difficulty that I have is this. At night, for that is the time when most collisions occur, how is a vessel which sees the light of another vessel to know the exact direction in which the other vessel is proceeding? She sees a red light upon her starboard bow, the course of this vessel may be more or less inclined to her own course; and there are positions in which if she ports, the two vessels must come together. It appears to me to be a difficulty, but I have no doubt that Captain Colomb will be able to explain it. Take some of the plans prepared by Captain Colomb. Suppose in Fig. 4 that "Y" ports her helm at once, she must inevitably run into "X." Or take Fig. 2, if "Y" ports when she sees the light of "X," it is much more likely to produce a collision, assuming that their velocities are equal, than if she either held on her course or starboarded. That is one difficulty which occurs to me. I fully appreciate Captain Colomb's remark, that by exposing the whole length of a ship's side to the approaching vessel you cover a greater space of water within which a collision can occur than if they were on opposite courses, the length of a ship being so much greater than the breadth. But that does not remove the difficulty which I feel as to vessels when they sight one another, turning their heads towards each other. However, I thought that I would mention my difficulty in order to give Captain Colomb the opportunity of explaining it away.

Captain COLOMB: I think practically the answer to Mr. Rothery will be found when I have the pleasure of sending him the paper in complete form with the diagrams. If he will then closely consider the letter-press beside the diagrams, he will see that the questions he has put are there as clearly answered as it is possible to answer them. The case referred to in Fig. 4—

Mr. ROTHERY: I meant Fig. 7, one ports and the other starboards.

Captain COLOMB: "Y," you observe, has ported, and has continued to port, after she had a distinct signal *not to do it*. "Y" was travelling down her curve, "X" was travelling along her curve, and at some point they both came to parallel courses. In that condition of things "Y" saw, on her starboard bow, the green light of "X;" it was then her business to have simply let go her helm, and she would have gone off at a tangent to her arc. What was wrong in her was, to persist in porting after she had seen that the ships were on parallel courses, and that the risk had passed.

Mr. ROTHERY: I have not made my meaning quite clear. The "Jessore" turns her head towards the "Consett," was that right or wrong?

Captain COLOMB: I say—right.

Mr. ROTHERY: I think she is wrong.

Captain COLOMB: She must have acted on the following supposition:—The "Jessore" is bound under the law to continue her course without variation, till the proximity becomes so close that it is clearly dangerous for her to do so. Then the question arises—when she is relieved from the obligation to continue her course, what is she to do? I say she ought to have brought the "Consett's" green light on her safe bow. Why? Because she makes her turn on an understanding that the other

ship is not going to give way as she ought to do. If she makes that turn and the "Consett" has no look out, she is clear; but if she makes the other turn, under port helm, and the "Consett" has no look out, she gets into the position of the Q collision in the Figure 4; but if she gets close, starboards her helm, and passes towards Y, and Y has no look out, X saves herself: whereas if X puts her helm to port and crosses the path of Y, she destroys herself. They are free of the law by reason of their proximity, and then it becomes a matter of risks and chances. Diagram 3 shows that the risk in turning towards Y—the starboard helm—for X is measured by that little circle shown at E, whereas the risk of porting her helm is shown by the big circle F. Therefore I say when it comes to matters of risk, choose that which gives the least risk.

Mr. ROTHERY: You do not mean that the "Jessore" would be right in starboarding as soon as she sees the other.

Captain COLOMB: No. The question is, when she gets so close that the law ceases to have hold of her, what is she to do? Then she ought to "give way."

Mr. ROTHERY: You mean when a collision is inevitable.

Captain COLOMB: No; very often she may avoid it, at the last moment, within a length.

Mr. ROTHERY: I think Captain Colomb's observations are extremely valuable. I quite see the great value of what he says, that it is merely the breadth of the ship that has a chance of being struck; whereas when the vessel goes off, it is the whole length of the ship; but at the same time I do not see the value of a general rule such as he has laid down.

Captain COLOMB: I do not lay down a rule. I am not raising a single question as to the law; I am not touching the law. I am very sorry the discussion turned in that way; because I am asking what should we seamen do, and what should the Courts teach us to do, *under the law*.

The CHAIRMAN: Unfortunately I have duties in another place. I should not, however, like to leave this theatre without saying a few words with reference to the very interesting lecture that we have heard. I am sure I am expressing the general sense of those who are present when I say that Captain Colomb, who has given us a very able and interesting paper, that Sir John Hay, Mr. Stirling Lacon, and all other persons who occupy themselves in carefully watching the cases of collision which occur for the purpose, if possible, of improving that law, are doing a public service and deserve the thanks of the maritime professions. Speaking as a member of the Legislature, I would say our course upon these matters is perfectly plain. It is our duty to take the best advice which can be obtained and frame our legislation in accordance with that advice. The House of Commons is advised by the Board of Trade, and the Board of Trade is advised upon these matters by the Admiralty and the Trinity House. I think the Legislature is adopting a wise course in confining its action to what is advised by the Admiralty and the Board of Trade.

Mr. SCOTT RUSSELL: Excluding foreign advice?

The CHAIRMAN: Certainly not.

Mr. SCOTT RUSSELL: That is the critical point.

The CHAIRMAN: Of course not. The rules cannot be international unless other nations are agreed to them. The rules are of very little use unless all maritime nations will consent to abide by them, and, as far as my information goes, the rules are international.

Mr. SCOTT RUSSELL: No.

The CHAIRMAN: Will you tell me the exceptions?

Mr. SCOTT RUSSELL: Mr. Stirling Lacon can, no doubt, give you the exceptions.

Mr. STIRLING LACON: England and France made these rules, and they were agreed to by thirty-four other countries in blind faith, without consideration; but many of these thirty-four Powers, and America especially, wish to repudiate them.

Mr. ROTHERY: At any rate they have consented to them.

Mr. STIRLING LACON: They have consented; but the Americans now say, "they "know what is best for themselves, and in future intend to act independently."

The CHAIRMAN: I should be glad if Mr. Lacon would mention to us what eminent maritime nations do not abide by these rules.

Mr. STIRLING LACON: I have told you that America has repudiated them,

and Sweden and Norway, and Denmark and France, in the strongest language addressed to this country, have asked for a change.

The CHAIRMAN: Have they actually repealed these rules?

Mr. STIRLING LACON: I do not know.[1]

The CHAIRMAN: We are all agreed that the rules are of very little practical value unless they are international, and they cannot be international unless other nations agree to accept them. It may be, differences of opinion may arise from time to time as to the expediency of these rules. The duty of any nation, which, speaking by the lips of its maritime authorities, disagrees with any one of these rules, is to make an appeal to the international tribunal. Passing from this point, I would venture to say, the rules are of very little value unless those whose duty it is to go to sea interpret them intelligibly. The majority of the collisions which occur, happen not so much from any imperfection in the rules as from some imperfection in the interpretation of them, or some carelessness and want of seamanship on the part of those in charge of ships. In Captain Colomb's very interesting paper, he quotes two recent cases of collision which have been before the Courts. I was interested to observe in his account of those two collisions, that the word "time,"—sufficiency of time,—is a prominent feature in both of them. In both instances a collision occurs, because one or other of the ships, whose duty it was to do a particular thing, did not do it in sufficient time, and the fact is, that time and distance are the vital elements in these matters. A thing may be right to be done when ships are a certain distance apart, but very wrong when they are at a different distance. I think that remark extends to Captain Colomb's suggestion. The movements which he prescribes may or may not be the right movements. That must depend upon the interval which separates the two ships from one another. It, also, must depend very materially upon the point insisted upon by Mr. Rothery, namely, the course steered by the ship whose duty it is to keep on her course, and which the other ship ought to avoid. No absolute rule can be laid down. The ship whose duty it is to avoid another must have regard to the course which that other vessel is steering, to the speed at which she is travelling, and to the distance which separates the two ships from one another. That being so, I think it really is better to leave the matter where it is now, according to the much abused rules. The rule is, "when two "ships are crossing, the ship which has the other on her starboard side is to keep out "of the way of the other." Mr. Scott Russell has insisted upon simplicity of language, I do not know how you could put a thing more simply than that. He can do it by porting, by starboarding, by putting on increased speed, heaving to, or by tacking. I remember once we had this matter discussed before the Royal Commission, and a Trinity pilot said, "When I am in charge of a sailing ship, and in "doubt, I always go about." That might almost be construed into a golden rule for seamen, "when in doubt go about." It would be most presumptuous in me to offer to a professional meeting the result of the experience of an amateur, but professional seamen will appreciate one vital rule which I lay down for myself as an amateur. I ought not to be so confident in my power of estimating distances as professional men are, and, therefore, I take extra care, I give way when perhaps it is not necessary to give way, stop when it may not be necessary to stop; in short, I take every pains that I do not, in my little ship, put myself in that state of proximity with another, in which professional skill in the application of these rules becomes of vital importance. I do not know that that would not be a rule which ought to be more frequently adopted by professional men. It is by shaving things too close and from the unwillingness to resort to stopping, that so many accidents occur. While attaching great importance to the practice of stopping, I will hesitate to go so far as Mr. Stirling Lacon does, and to say to a man, in all cases, he shall stop. I must not detain you any longer. This paper is a very valuable contribution to the literature of this subject. I trust that when it is published it will be accompanied by the diagrams which we see on the walls, for without those it

[1] No country by itself can repeal an International Law; but England, by an Order in Council, which has no effect as regards foreign countries, has altered the law contrary to the strongly expressed advice of the Privy Council.—W. S. L.

will lose a great part of its interest and value. Assisted by those diagrams, I have no doubt the paper will set men thinking upon these things, and tend to keep those who are responsible for giving advice to the Government alive to the fact that their proceedings are constantly under observation. I am sure I shall only be expressing what is felt by everybody, when I say we are very grateful to Captain Colomb for his paper, and that we recognise in it that ability that has never been wanted in the speeches he has made and the papers he has read before this Institution.

Mr. STIRLING LACON: Mr. Chairman, you asked me a question, and I did not at the time recollect that several countries besides those specified, have expressed a desire to have a revision of these rules.

The CHAIRMAN: It is one thing to desire a revision and another thing actually to carry that desire into effect.

LECTURE.

Wednesday, February 13th, 1878.

LIEUT.-GEN. C. P. BEAUCHAMP. WALKER, C.B., Director-General of Military Education, in the Chair.

MILITARY NOTES ROUND PLEVNA AND ON THE DANUBE, DURING DECEMBER, 1877, AND JANUARY, 1878.

By Lieutenant FRANCIS WELCH, 25th Regt., King's Own Borderers.

I SHOULD not have had the temerity to appear before you were it not for the kindly advice and encouragement I have received from one whose voice has been heard in this room. Though a soldier of no mean capacity, he wears a black coat; his experiences of modern warfare are many—I speak of our latest maker of military history, Mr. Archibald Forbes.

Red Cross Hospitals at Bucharest and Turnu Magurelle.—Towards the end of last November, Mr. Henry Shaw Kennedy, 41st Regiment, and I found ourselves at Bucharest. We examined the hospitals there. We found big men, big chest measurements, but rather more groaning than would have been found in an English hospital. The number of hand-wounds pointed to firing over a parapet, the hands only thus being left exposed. The men hit in the head would, of course, have been killed.

At Turnu Magurelle were the wounded from the Rachova action, with the same enormous percentage of hand-wounds. The doctors here openly stated that from the position of the wounds they considered many of them self-inflicted. The Roumanian account of the fighting at Rachova said that there was a regular *mêlée*—that bayonets were used. We hunted for a bayonet wound, and becoming acquainted with Dr. Maturin, found he had seen one out of 500 cases that had passed through his hands. The wounded man had no story to tell, and did not know how he had been wounded. Considerable jealousy seemed to be shown by both the Russian and Roumanian authorities to our Red Cross medical men. They were kept back, often perforce kept idle, when there was work enough to be done at the front. The Roumanian doctors, with the exception of General Davila, who, by the way, is a Frenchman, do not seem to have impressed our doctors with

Fig. 1.

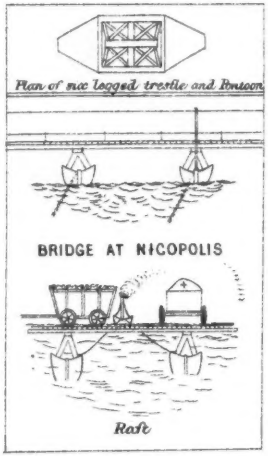


Fig. 2.

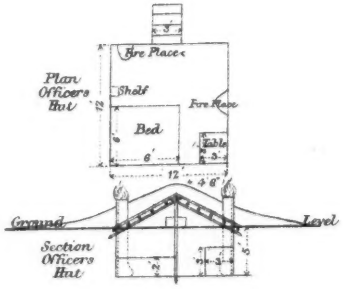


Fig. 3.

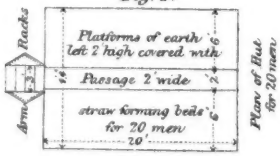
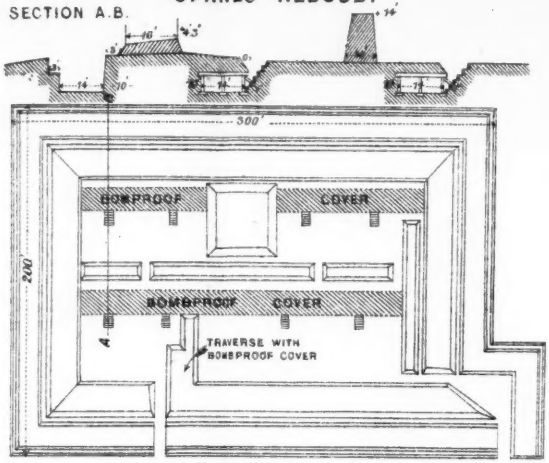


Fig. 4.

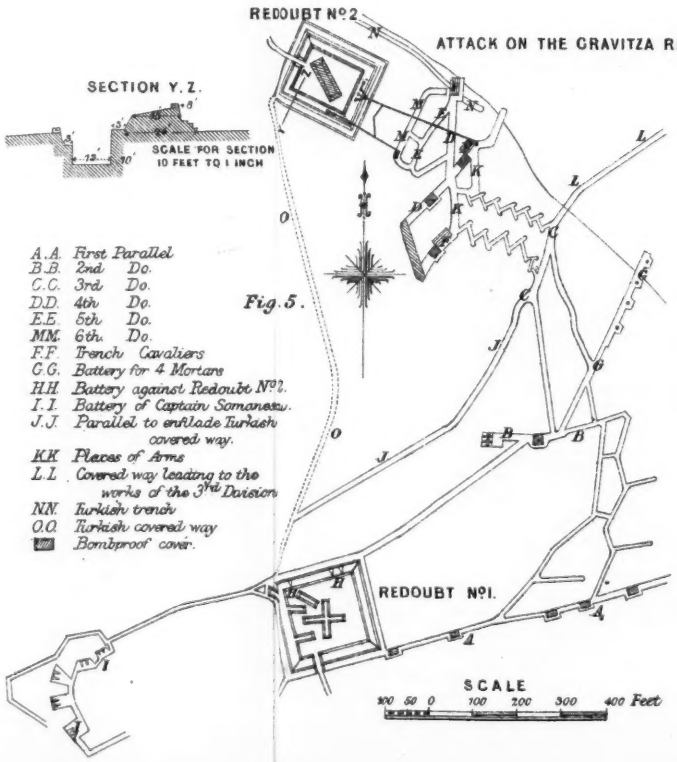
OPANES REDOUBT



Scale, 24 Feet to 1 Inch

ATTACK ON THE GRAVITZA REDOUBT

Fig. 5.



A.A. First Parallel
B.B. 2nd Do.
C.C. 3rd Do.
D.D. 4th Do.
E.E. 5th Do.
M.M. 6th Do.
F.F. Trench Cavaliers
G.G. Battery for 4 Mortars
H.H. Battery against Redoubt Nº2.
I.I. Battery of Captain Somanes.
J.J. Parallel to enfilade Turkish covered way.
K.K. Places of Arms
L.L. Covered way leading to the works of the 3rd Division
N.N. Turkish trench
O.O. Turkish covered way
Bombproof cover.

ATTACK ON THE

Fig.

MINING AT

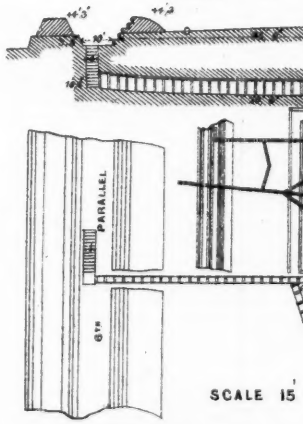


Fig. 6.

K ON THE GRAVITZA REDOUBT

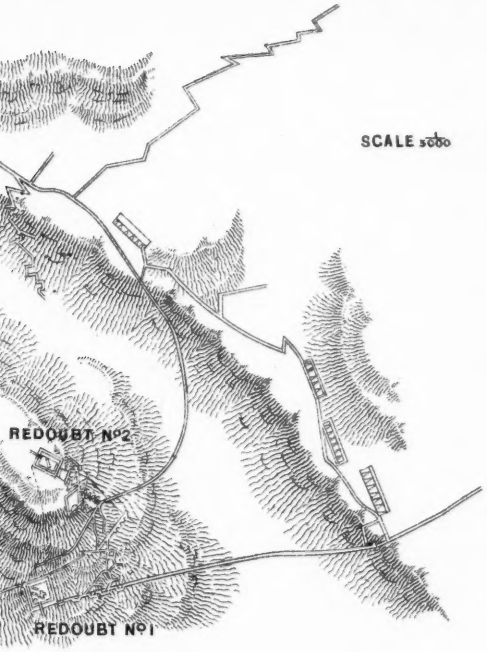


Fig. 7.

NING AT GRAVITZA

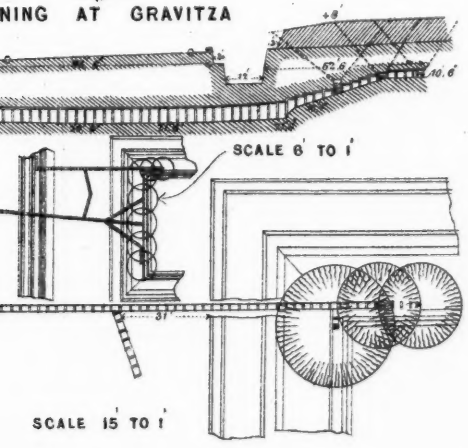


Fig. 8.

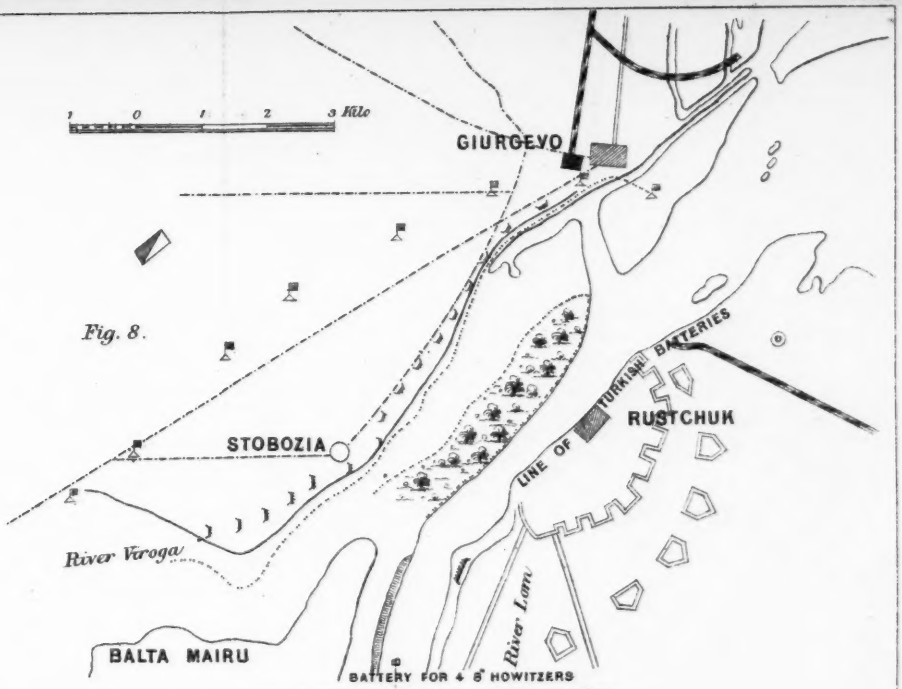


Fig. 9.

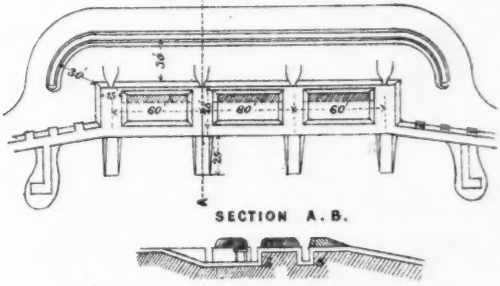
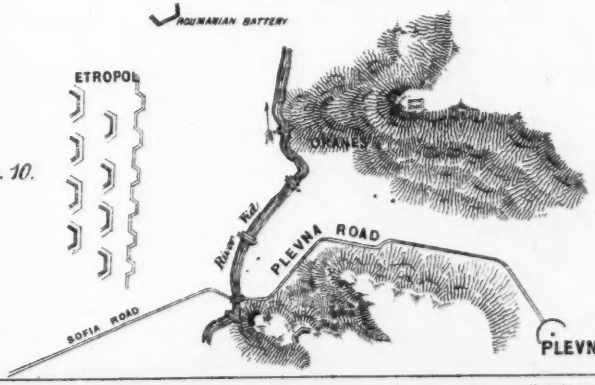


Fig. 10.



Thomas Kell, Lith. 40, King Street, Covent Garden.

their skill. One was pointed out to me who had earned the title of "Old Mortality," through the number of cases that had terminated fatally under his hands. One thoughtful arrangement was in vogue, the invention of the only foreign medical man in the Russian service, an American. This was a "brassard," placed on the arm of each wounded man on the battle-field, so that every one could see that those so marked would be taken care of, and could at once pass on to the succour of the less fortunate soldiers who were not thus labelled. The great complaint among the doctors at Turnu Magurelle was the long delay that occurred between the time the men were wounded and when they arrived in hospital. Some of those wounded at Rachova were jolted about in common wooden carts for nearly three days, entirely exposed to the wet and cold; a good many of them were starved as well. They also complained of a dressing used at the front; some preparation of iron, which stopped bleeding very quickly, but the after effects of which were very detrimental to recovery. There is something to be said on both sides about this. The doctors on the field have no time to attend each case as it should be attended to. This application gives each some chance of life, and at all events stops bleeding to death on the spot. After the Gravitza attack, men were three days before their turn came to be attended to.

The Bridge over the Danube at Nicopolis.—To begin with the river, it was about half a mile wide. On the north side, it is approached by a road running on an embankment through low-lying ground, for a distance of 2 kilometres. On a bank from which this road comes, is Turnu Magurelle. This low-lying ground is flooded in spring, and was in a transition marshy state when Nicopolis was taken by Krudener. Half-way from Turnu the road was under repair, the carts here consequently left it, and wandered about the road, each one trying a fresh place, in the hopes of finding it lighter going, finally all converging again at the bridge head. On the southern side of the river, rising straight from the water, is the strong fortress of Nicopolis, the town nestling at its foot. The current of the river is about the same as that of the Medway when the tide is ebbing its strongest, and is principally felt towards the southern bank. Across this half mile of water was a bridge of 100 punt-shaped pontoon boats (see Plate IX, Fig. 1). The distance between boats from centre to centre, was 8 yards. The boats were anchored with very short lengths of cable to all sorts and sizes of anchors. The up-stream cable was rope, the down-stream one chain. Why the stronger fastening should be where was the least resistance, was probably that the chains were not sufficiently long for up-stream cables. In each boat which was not decked stood a six-legged trestle, very solidly bound together. These trestles were not fastened to the boats, but stood on a frame that exactly fitted into the boats. On the top beam or transom of the trestle, and at right angles to it, were placed at equal distances four square road-bearers. These road-bearers overlapped very considerably; they were clasped to the transoms and to each other by iron bands, so tightly screwed up that the iron bit into the wood. On the road-bearers were placed the

chesses, which were held down by ribands of all lengths and sizes. The rack lashings were all makeshift ones, rotten ends of rope for the most part; a few deal stanchions with single rope formed a rail. In every second boat was a small telegraph post, which supported a single wire from the front. The bridge was just sufficiently wide for a cart. At each end was a Dorobantz guard; a Dorobantz means a Roumanian militia man, or, to be more particular, one belonging to the Roumanian Territorial Army. The duty of the guard was to look after the bridge, to let no one on to it as long as the red flag flew at the other end, and of course to allow no one across without a pass. The red flag was used to show that traffic at the time was going on from the side on which the flag was, to the other. At each end of the bridge was a sentry box, that is worthy of notice, made like an enormous gabion, the work being carried up higher in front where the door was so as to get a slope to the roof, which consisted of a hurdle, covered over about a spade deep with earth. The defects of the bridge seemed to be the tightness of the iron bars round the road-bearers, the useless length the road-bearers overlapped, which increased their leverage, one against the other, the short length of the cables, which fastened the boats so tightly down that they lost their buoyancy, and above all the boats not being decked. This was the bridge the Roumanians put their faith in; not only that, but on many occasions it was spoken of in the highest terms in my hearing.

We now come to the military uses for which it was built. It was the main thoroughfare for all the Roumanian forces, and for some of the Russian going to the front at Plevna. All the bread for both Russians and Roumanians was baked in Turnu Magurelle, and crossed this bridge in carts. All Roumanian and some Russian ammunition passed this way. Forage the same. Empty carts, carts full of sick and wounded, made the return journey. On Thursday, 6th December, this bridge came to somewhat serious grief; 16 boats were sunk, some 16 others were more or less wrecked, and with them, of course, the roadway they supported. The disaster came about in this wise. A strong easterly wind blowing against the stream brought up a nasty chopping sea, that the day before dragged an anchor or two, and stopped traffic for a few hours. The following night it blew hard from the same quarter; the waves became so large that they got into 16 boats, and sunk them at their moorings. On going to the spot in the morning we traversed 55 boats, which, twisting about, were doing their best to get loose. The distance from the shore to where the bridge ceased to be one, was a quarter of a mile exactly. The scene reminded one of the old print of the flagship at Trafalgar, surrounded by half-sunk boats, rafts, and beams of wood. Some clear spaces in the troubled waters showed where the pontoons had sunk entirely, then for about 200 yards were boats, trestles, superstructure, in every conceivable state of wreck. Every now and then the light spars that carried the single telegraph wire from the front bobbed their heads helplessly above the water. The iron bands that grasped the road-bearers and transoms had proved themselves weak, the leverage

brought to bear on them by the road-bearers snapping them in every direction. The movement in that part of the bridge still holding together had in many places been violent enough to break the rack lashings, force up the roadway, and move the ponderous road-bearers, loosened from the iron clasp, along the transoms.

On looking around to see what steps were being taken towards mending the broken and securing the intact part of the bridge, I found half-a-dozen Roumanian soldiers seated on the boat next the broken part, who must evidently have been there for some purpose, as no one could have chosen the centre of the Danube in a cold easterly gale on a dangerous bridge without an object. Three steam launches with steam up were also on the river, that could easily have been made of use in towing away some of the wreck, especially some of the large part of the superstructure, which, floating raft-like on the water, was gyrating wildly about, to the danger of the unsunk but disabled pontoons. On coming off the bridge, an Officer informed us that there was too much sea on for any repairs to be made. Drawn up on the wrong side of the river were about 200 carts full of bread, which the Roumanians and Russians at Plevna in the ordinary course of things would have eaten two days afterwards.

The allies at no time were able to collect more than two or three days' supplies, and were as a rule only just able to get enough to the front for daily consumption. The breaking of the bridge occurred on the 6th; no bread left till the 10th, as a fact the allies had only a small allowance of biscuit on the 8th, 9th, and 10th. This reacted on the Turkish prisoners.

On the 8th, the water having become calmer, communications were again established in a small degree. Two pontoons with the portion of roadway between them still on the trestles, were detached from the remains of the bridge, a man with an oar was put in the stern of each to steer, a steam tug took the contrivance when heavily laden with a couple of carts in tow, and laboured over to the other side. An Officer was in charge of the landing stage. The progress of the course was slow, but was rendered still slower by the want of proper arrangements. The small landing stage made of the superstructure of the bridge was a foot lower than the raft moored alongside it; both were so made that they could not get quite close together, but a space was left between them just large enough for a horse or bullock to get his leg in. The minutes lost from this cause alone would, if added together, have made many an hour; a few planks, a couple of fascines, and a little earth would have remedied it. The boards of the raft and platform were not covered in any way, so time was also lost in inducing the beasts to face them. Everybody was allowed to crowd round the landing, carters fought for first place, everybody lost their tempers. The same landing place was used for both embarking and disembarking, causing double traffic over the soft earth. So eager was everyone to get over, that the carts closed on the landing stage, leaving no room for the disembarking carts to get off. In all this confusion, occurred a scene which shows the stuff a Russian private soldier is made of. I had noticed a Russian driving a Commissariat cart on

account of the successful way in which he was gradually working towards the landing stage. He succeeded in getting as far as the stage long before his proper turn, but was here stopped by the Dorobantz sentry. He tried to force by, the sentry tried to stop him; the sergeant of the guard appeared and eventually struck the Russian, who struck back with his whip. Four or five of the guard set upon the one man, he was hit on the head, banged in the back, knocked from one end of the long box seat to the other. All this time his left hand never left his reins, regardless of the punishment he received; he still found time to give his horses a whack between the strokes he dealt evenly round to his enemies, and eventually, in spite of all of them, he and his cart were on the landing stage. A bayonet had been placed at the Russian's chest, and things were beginning to look serious, when a Russian Officer pushed through the crowd, shook his whip in the face of the Roumanian under Officer of the guard, commanded the Russian cart to be taken across first, and thus order was restored. The Russian private soldier put his cap straight, never even looked at his late opponents, and went on to the rafts as if being knocked about by five men was what he was daily used to.

There are four salient points in the character of the Russian private soldier that were forced on us whilst journeying backwards and forwards on the road between Turnu Magurelle and the Plevna front. Two moral, viz. :—1st. His capacity for hero worship. 2nd. His idea that he was on a crusade. Two physical: 1st. His patient endurance. 2nd. His love for drink.

His idol when I saw him was General Skobeleff the younger. If ever Napoleon's calculation that moral is to physical force as nine to one is to receive exemplification in the immediate future of the Russian Army, one may look to Skobeleff as the man that will furnish the example. Meet a soldier on the road, he does not ask you news of the Russian Army, or the movements of the Grand Duke. It was, Has Skobeleff taken Plevna? In this one question is embodied the greatest difficulty that a military commander ever had to solve. So thinks the Russian; but not for a moment does he doubt that young Skobeleff can do it. It is always Skobeleff; their dull faces light up, and they linger fondly over the name as they say it. Having once spoken to a man who had served under him, you do not want to see him to know he is a true leader of men. You must remember that this was no General who had made himself popular or earned a lucky name by his successes. At this time the world was still ringing with the bloody defeat this very man had undergone; how he went into action with 12,000 men and came out with 4,000.

Besides his hero worship, there is another moral force that helps on the soldier. In the early part of the war we were told of the Cossacks' wonder when he saw the rich surroundings of the people he came to emancipitate from slavery. Since then, many new Russian forces have arrived, and in place of finding smiling cornfields and vineyards to march through, are snow plains and hills. The Bulgars' cattle are sold, their horses working at carting stores, so the simple Russian, ignorant of the gold pieces in the Bulgar's belt and seeing his apparent

poverty, is again beginning to believe he is on a crusade. The feeling is not confined to the men. I spoke on this subject to a young cavalry Officer at Giurgevo on the 3rd of January. He raised his cap from his head and reverently and in all sincerity prayed that God would give them strength to free the poor Bulgars from the hated tyranny of the Turks. The real truth of the conditions under which the Bulgarians and Turks are, is of no military importance, but it is of military importance that this feeling should be fostered, and this is done.

To give you an instance of the patient endurance of the private soldier. I never saw so patient a man. We had arrived at the Tartar village marked Debova, half-way between Turnu Magurelle and Poradim; it had rained all day, the muddy tracks—you cannot call them roads—were ankle deep, and in places knee deep in mud; bullock carts and Commissariat waggons took double teams to move them over the worst parts. You arrive at some idea of the badness of the roads by what a Commissariat Officer told me on the 27th November, that of 100 empty waggons sent from Plevna three days before, only thirty-six had arrived at Turnu Magurelle, the rest breaking down. The distance is 22 miles measured in a straight line on the map to Poradim from Turnu.

A soldier came dripping into the Tartar hut where we were. He met with rather a cold reception from the Mussulmans and our Turcophile interpreter, but was allowed to sit down, take off his boot and wrap the cloth that answers for a sock round his foot in a more comfortable manner. Where was he going? To Plevna. Where had he come from? Oh, from Nicopolis. He was wet through, wasn't he? Oh, yes, he was wet. What had he had to eat? Why his bread, of course. He'd got a bit of bread left; and out of his pocket he pulls a sodden lump of black bread as full of water as a sponge. Well, where was he going? He was going on. But where was he going to stop the night? Oh, anywhere on the road, he didn't know. By this time his boot was once more on his foot, his heavy pack on his shoulders, and with his rifle in his hand he had just reached the door. A gleam of intelligence shows on his stupid looking face, I hear the word Skobeleff, and do not wait for the interpreter to tell me that the usual question has been put, Has Skobeleff taken Plevna?

Love of Drink.—Fortunately for the Russian army, drink was not obtainable on this road. This seems the great defect this patient man has; he drinks when he gets the chance. I saw many drunk in Turnu Magurelle, but none nearer the front; the Officers make no excuse for it, but take it as a matter of course that their men should get drunk whenever they get the chance; in fact, want of sobriety seems to carry but little reproach with it in much higher circles than that from which the Russian private soldier comes.

On our way out of Turnu Magurelle one day, we found a guard on some carts just starting for the front; one of their number was drunk, and they were employed in tying him on the top of a load of bread in a calm business-like way; one remarking that no doubt the jolting would sober him; in fact Punch's story here holds sway: "I wish I

"had half his complaint," would fitly describe the way a drunken soldier is looked on by his comrades. So great is the craving for drink, that the men consume a compound called "spiritus." Spirits of wine of the vilest sort would be the English equivalent.

Want of Officer's Supervision on the Road to Plevna Front.—To the question which no doubt has crossed your minds, how it is that single men were strolling about a road, I can give you no satisfactory answer. Between Nicopolis and the lines round Plevna there seemed to be nobody in charge of the road. You met Officers, of course, but each had his own business to attend to. At the sides of the road there were Red Cross hospitals, and now and then places for stores. Quartermasters, Paymasters, and doctors at each. You met private soldiers, sometimes singly, sometimes in twos and threes, plodding steadily through the mud under no control. This want of Officer's supervision acted badly in delaying provisions on their way to the front. If a cart broke down, nobody had authority enough to pitch it bodily on one side and let the string behind pass. Probably the whole *cortége* would be glad enough to have a halt, and thus valuable time was lost. I have given the Russian soldier all credit for his patient qualities, but, like most passive qualities, it betokens a want of individual energy, the sentry in charge of carts sitting down quite as often as the Bulgar driver. Besides this want of supervision and bad roads, another great cause of stoppage was that the only way across the Osma, a sluggish, deep river, about 30 yards wide, flowing between steep banks 8 or 10 feet high, was a narrow high pitched stone bridge, with no room for two carts to pass. The ground at each side of the bridge was soft and marshy, and here it was that we realised the possibility of the story told us of a pony being drowned in mud. However much the carts diverged from the track in other places, here they were obliged to pass the bridge and to struggle through the deep mud. The dead ponies and cattle that lined both the approaches to it, showed how severe was the task. The thought of putting two or three bridges across seems never to have occurred to anybody.

Round Plevna. Hospitality.—Our first experience of the front was one of hospitality, quite Arab in its perfectness. The 29th we spent in a hut at Verbitza, the Roumanian head-quarters. The talk here naturally turned to the war, being specially directed to Gravitza and the state of starvation Plevna was reduced to. In talking about Gravitza, I may mention as an example of want of technical knowledge, that a Staff Officer having drawn a profile of Gravitza Redoubt No. 2, failed to complete a plan from the profile. You must remember that this was on the 29th of November, when the siege had been going on for some time, and men's minds had been specially directed to the engineering part of soldiering. That very night we were fortunate enough to hear what musketry fire round Plevna was like. All day long the air had been filled with the incessant shrieking of shells, 400 guns constantly firing. At 9 o'clock we were startled by the sudden ceasing of the artillery. Everybody was outside their huts in a moment. There was a dense fog. Presently crack goes a rifle, one, two, three, dropping shots, and then to the south such a roll of musketry as I had

never before heard, extending quickly from a few hundred yards till at least two miles was covered by it.

"It's Gravitza," says an A.D.C. "No, it's Skobeleff," says another; and presently they all agree it's the "Green Hill" that is the centre of it. We are by this time a knot of five or six, some putting on their swords and great coats as they join us, awakened by the sudden silence, as they say. Presently from the opposite side of Plevna, out by Sursulu, and down by the Vid, comes more musketry fire. "What a night for "Osman to break out," says one. A gasp of excitement goes round the circle that tells how well they know that some day soon there will be warm work for them. An Officer restlessly goes off to the telegraph office; back he comes—no news. Presently comes word that a *sortie* is going on; a few minutes more and it is again contradicted. For an hour we stand in the cold fog listening to the rattle, sometimes dying away only to break out again with greater fury. At 10 o'clock exactly, a flash comes through the fog; there is the report of a position-gun in front of us at Fort Alexander. An Officer near me touches his cap, and says quietly to himself, "Thank God;" and we all know the infantry are out of the way. A couple of minutes more and the big guns are once more fulfilling their useless mission of throwing numberless shells into the soft earth. Rifle firing of this sort was of constant occurrence. Why or how it began, nobody could make out. From the anxious way it seemed to be taken, it must have been a constant source of worry to the Roumanians. As I stood in the fog that night I could see there was a general feeling of distrust in their own arrangements. Perhaps distrust is too strong a word, a kind of feeling of not knowing what would turn up next.

Next day we were taken to see a prisoner as an example of the starved condition of the Turks. What I saw was a good-looking, thin, wiry man about 5 feet 9 inches; his clothes torn, and of much too light material for the time of year; altogether what I should call a man in hard training, fit in racing terms "to run for his life," and showing not a bit more signs of wear and tear about him than five or six weeks' hard campaigning would warrant.

As I have mentioned a hut, I give you the description of the invariable pattern both Russians and Roumanians used at the Plevna front. The two conditions under which the huts seem to have been made were:—1st, that wood was scarce; 2ndly, that the greatest warmth possible was desirable. The hut complied with both. Little wood was used. The hut was very warm. A square or oblong of ground is dug out to the depth of about 5 feet (Fig. 2), and of the size that the constructor wishes his hut to be. On one side of this square the earth is left of the height he prefers his bed, on the other side an earthen table and shelf. At one end the earth is cut away so as to form a ramp up to the level of the ground outside, or else steps are built. At each end are placed uprights which are connected by a cross-beam. On this cross-beam are placed one end of the rafters, the other resting on the ground level. Over the rafters are branches, then maize straw. On the top of all comes the earth that was taken out first.

There are often two stoves, one at each side of the room, made of clay. One or other of them is lit according to the direction of the wind. At the end where the ramp or steps are, comes the door, at the other, a small window with oiled paper for glass. On some of the huts their owners have expended a good deal of trouble, being prettily revetted all round with hurdle work; in one case the inside was covered with the canvas of a *tente d'abri* by way of paper, hurdle-work all round the bed, the steps, &c., the outside of the window, which was glazed, being finished off in imitation of a sand-bag battery.

The soldiers' hut (Fig. 3) was the same sort of thing, generally made to hold twenty men, with a place on each side of the steps made for arm-racks, and a raised platform on each side covered with straw for men to sleep on, ten on each side.

Earthworks.—The Turkish position of Plevna is something like a horseshoe (Fig. 10), having Opanes at one cog, and the batteries above the bridge at the other; Gravitza at its toe.

Speaking generally, the redoubts are all of earth, revetted outside with sods, inside with gabions, having low parapets and high traverses. Steps cut in the ditches. Very good shelters under the traverses. They are of all shapes, but all small; none have any flank defence.

In considering the Turkish works round Plevna—although the result is acknowledged by everybody to be grand—you can scarcely give the credit of this result to any one man. The earthworks grew after each successive Russian attack. Where the Turkish losses were greatest an earthwork appeared. In this way, one may say, the Russians, by their senseless assaults, taught the besieged their weak points. The Turks learnt the lesson very readily, and profited by it. The ground worked in is a heavy alluvial soil, without stones, that stands well at a very steep slope, even without revetting, and is very easy to dig. I propose to take examples of the work of each.

Shahoffskay's Attack.—You all remember Prince Shahoffskay's mad attack on Plevna on the 31st July, when finding Krudener on his right, unable to make any headway, he launched 12,000 men against a larger force safely stowed away in earthworks. The result was what the result only could be, his beaten remnant of an army came back to him a panic-stricken crowd. They were got together again on the line of hills that skirts the road running north of Poradim two days afterwards, and there put up earthworks. These works were never used, and may be looked upon as a truer test of Russian capabilities than any of the works round Plevna, which of course were improved from day to day. The work must have been done by tools requisitioned from the Bulgarians, the Russians having none with them at the time.

The gun-pits and epaulements are the same as ours; so good is the ground to work in, that the earth for the parapet of the epaulements was got in some cases from a small trench in front of it only, and this without revetting. The work is perfect and looks like a model. The trenches, though constructed in such haste, can scarcely be called shelter ones, being large, the biggest giving quite six feet of cover, a step being cut to stand on when firing, and having a parapet fit to

resist siege guns. Owing to the round form of the hills and the trench accurately following the same contour throughout, the enfiladed parts are protected by a still higher parapet.

The trench was placed in front of the gun-pits about 25 feet lower in point of contour, and about 100 yards in point of space.

The fidelity with which the trench runs in the same contour is very marked. Both Russians and Roumanians show a preference for rifle-pits to hold six or eight men over continuous trench. They give about 4′ cover, are crescent-shaped, with the convex side towards the enemy. I thought at first that the preference of pits over trench was that their men having been lately beaten, they would be more likely to hold out longer in a pit, being loath to face the open, but I afterwards found they always preferred the pits. They were generally placed in three rows, with sufficient space between each row to allow those behind to have a clear front. I got into several pits and was astonished at the enormous range of fire they had. This is owing to the hills rising at the same gradient throughout and the grass being withered short.

In some of the early Roumanian work the trenches are fairly slight, giving in one instance about 3 feet of cover with no room for communication behind the firing rank. Originally, perhaps, this trench gave a little more cover, but the parapet had sunk down from the action of rain. In nearly all the works, even the smallest, fireplaces have been cut out of the parapet side of the ditch; in some instances the chimney coming out under the parapet, in others the smoke escapes straight up from the fire. The absence of hasty entrenchment (three minutes' work) is to be explained by the original entrenchments being improved upon as occasion required.

Roumania.—At Verbitza was a peculiar wall, about 6 feet high, loopholed; 4 feet thick at the bottom, 2 feet thick at top, made of sods, and about 400 yards long. It stood on the plateau at Verbitza, and had a clear, flat front of about ¼ mile. It was supported by a few pits in echelon on each flank. The sods and earth composing it had been dug irregularly from the front of it; there was no attempt at a ditch. Some of the Roumanian works were of the Redan trace, consisting of two lines of parapet joining at an angle of 120°, with the ditch dug apparently only with the purpose of obtaining sufficient earth to make a 4-foot parapet.

In some of the Turkish works, steps have been cut out on the counter-scarp side of the ditch, as in the Gravitza; in others, as in Opanes, on both sides. They were accustomed to place men on these steps when expecting an attack, also in the bottom of the ditch. The Turks stuck to this plan always, I believe, and the Russians seem to have been unable to shell them out.

I propose to deal with only three redoubts, the two over which there was most fighting, the two Gravitzas, and the one that is considered the strongest point round Plevna, viz., Opanes. You have here a plan of Opanes (Fig. 4). All the shaded parts are perfect shell-proof underground quarters large enough to hold 300 men. I had an opportunity of seeing a section of these shelters as the Roumanians were

digging out the wooden rafters that held the roof for firewood. These rafters ran from the parapet, and the traverses that ran down the middle of the redoubt, and at right angles to them. They were in places kept up by perpendicular supports set in the floor of the shelter. From the irregular way the supports ran a good number of them had probably been used for firewood. The thickness of earth was from 3 to 4 feet. The way down was by stairs, as shown on diagram. This was considered the best bit of work round Plevna, and I felt flattered by being told an Englishman must have made it.

The ditch is about 12 feet by 10, getting deeper on the side marked A, and shallows to about 6 feet at B. The parapet, outside and in, is revetted with sods placed as regularly as bricks in a wall and nearly as perpendicularly. The traverses are revetted in the same way. The redoubt stands on the end of a spur that runs out over the Vid. The ground all round was scored with shell marks; there were also newly done-up places in the revetment, but none of them extending above a couple of feet, so great is the resistance the shells met with from the earth. The whole work looked trim and new; if it had not been for the old rags scattered everywhere about and a broken stretcher, the blackened bed of which showing how often it had been used, one would have thought it had never seen war. Just outside the redoubt stood a row of fourteen tombs, two deep, arranged with the greatest neatness, revetted with sods, and having a little parapet running round them. A likely spot for the position guns that were known to be in Opanes, but which have not been found by the Roumanians.

The end of the spur on which Opanes stands running out to a sharp point, the work does not quite cover all the ground, so a small redoubt with one gun was made a few yards down the slope. Some rifle-pits at the crest of the hill complete the work. This position with the works round it, eleven redoubts, is capable of defence by itself. It commands the Vid, the battlefield of the 10th, the valley of Plevna and Plevna itself, the Sofia road, the permanent bridge, the village of Opanes, and the redoubts to the north (Fig. 9).

The story of the taking of Opanes as I heard it, has never got into print. On the morning of the 10th the Roumanians occupied the village of Opanes, which is situate about two-thirds of the way down the slope that ends at the Vid, and on the top of which stands the fort. They pushed out of the village; two of the leading men, both Englishmen, finding the fire very hot, ran on and got to a dip in the hill by which they were safe from the fire from the rifle-pits. Two other men followed them. These four, when the fire slackened, again advanced, but once more being shot at, threw themselves down, holding the butts of their rifles in front of their heads, keeping their faces well pressed to the ground. Once again the fire stopped, and to their surprise a Turk with a white flag appeared. They jumped to their feet, called to their comrades in the village, and found about a couple of hundred Turks who wanted to lay down their arms and give up the key to Plevna. The same story was told me at two different times, in different places, and different language, but circumstantially the same. My informants were the two Englishmen I spoke of.

Gravitza.—For the plan of the two Gravitza redoubts and the Roumanian works round them you are indebted to my companion, Mr. Henry Shaw Kennedy, of the 41st Regiment (Figs. 5 and 6). The shape of the works are as they were on the day the sortie was made. The inside of No. 2 is 34 metres broad, 47 long, measuring from inside parapet, thickness of parapet 4¼ metres, ditch 4. The parapet was inside strengthened with gabions, outside with sandbags, sandbags standing on the top of parapet, loopholed, and was repaired with sandbags, the traverses shaped as you see them, about 14 feet high; shelters under the traverses. It was connected with Plevna by a long covered way, running up to Buchova. The parapet of this covered way was full of dead bodies, slenderly covered with earth, which the shells were constantly exposing.

No. 2 Gravitza.—A redoubt about 52 metres square, measuring inside the parapet; traverses about 14 feet high; parapet of less height than the Turkish redoubt; ditch 4 metres; revetted with gabions inside; shelters under the traverses. It was connected to the left by a covered way to a battery of 10 guns. The Roumanians, after their unsuccessful assault, took to sapping; they made their first parallel AA. The shaded parts in this, as in the other trenches, are shelters. They then sapped up a distance of about 100 metres and made the second parallel B, and joined this by a covered way to the front face of the redoubt, thereby enfilading the old Turkish connection between the two redoubts. CC forms third parallel, DD fourth, GG fifth, MM sixth. This last brought them within 30 yards of the Turks. FF represent two-trench cavaliers, from which they could set a better view of the enemy. GG shows a trench they pushed out from the second parallel and in which trench they placed four mortars. H shows the battery in the redoubt which was directed against the Turks in No. 2, the distance it had to fire being about 250 yards. II shows a battery to the left which did not fire at Gravitza 2. II was a parallel thrown out from the third one to cut through the covered way that joined the two works when in Turkish hands. KK were places of assembly; LL was the covered way that joined the works here to that of the next division, the third. *aa* is an old Turkish trench. *bb* is the line of the valley.

The ground here dips, rising again to where the batteries shown on the other plan stand. The ground on which the two redoubts are is on a narrow spur running down into the valley at a small slope. No. 2 is situated almost at the top of this ledge, No. 1 about half way down. You must bear in mind the narrowness of this ledge, else you would naturally suppose the Roumanians would have sapped up to the angle instead of the side of the work. You can see the breadth of the hill by the breadth of the parallels. The top redoubt is most cunningly placed so as take full advantage of the commanding situation. The work made here at Gravitza must be considered of great value. The ground certainly is easy to work in, but every inch of it was dug under fire, and that of the very hottest description. It rained hard at this time, and it was common for men to be brought out of the trenches, which were knee-deep in mud, with their legs and feet in a state resembling frost-

bite. The sapping was done by two men digging sufficiently deep to cover themselves, the ditch being taken out to its full proportions by those behind them. The Roumanians, not content with sapping, took to mining, and drove a shaft from the point F and another from the M parallel. These were commenced in the trench and sunk to the depth shown in the plan. The powder was laid in three charges in the left gallery and four in the other, under the Turkish parapet, as marked in the plan. (Fig. 7.) The circles in red on the plan show what they expected the area of the crater of each mine would be. Calculating by the formula used by the R.E., the charges were probably from 350 to 500 lbs. You have also the profile of the mine sunk. The dotted line represents the ground level; the various numbers show the heights and depths above and below the ground. No. 3 plan shows what they hoped from both mines when exploded together. By this the whole side of the work should have been demolished, as shown by the circles. All the mining was finished some ten days before the sortie; the fuze was laid and all ready to be blown up in an instant; the Turks at this time expecting to be mined sunk a shaft in their front ditch, hoping to come on the Roumanian mine if there was any. An Officer who had gone into the mine told me he could hear digging above him. Anyhow, the Turks did not find their enemy's work.

The question, I have no doubt, has already been mentally asked by you, Why was not the mine sprung and the attack made? The reasons for the attack were many:—

1st. The Roumanian troops had always shown the greatest courage in their assaults.

2nd. They had successfully sapped up to within 30 yards of their enemy.

3rd. They had as big a front as he had to deploy.

4th. Their powers of bringing up men to the front were as good through their trenches as that of the Turks through their long communication to Buchova.

5th. If the mine acted anything like what they expected it to do, the Turkish fire would be deranged sufficiently for the first rush to get over almost unscathed.

6th. They had the moral advantage of being the attacking party.

Against them was the general belief that the Turkish redoubt was mined throughout, and that they, the Roumanians, would be blown sky-high the moment they found themselves masters of it. I have said that the power of bringing up men to the front was as much in favour of the Roumanians as the Turks; by this I do not mean to say that they had as many men there originally. Besides the Turks inside the redoubt, the ditches were filled by them and this in spite of the Roumanian guns and mortars far and near. There were many hot arguments on the spot as to why Gravitza No. 2 was not taken, but none appear conclusive, unless we believe that the Russians meant to have another general attack on Plevna, and that this mine was kept for that occasion. Musketry fire generally went on night and day here; it was a common saying that any man wanting to malinger had only to hold up his little finger above the parapet and

it would soon be shot off for him. Not that the shooting was particularly straight, but calculating that there were so many bullets to the square foot flying about. When talking of those spots, where rifle-fire of the hottest sort was of daily occurrence, such as here at Gravitza, or on the Green Hill with Skobeleff, the question is forced on one, Has any lesson been taught us on the subject of random and straight shooting? Here was every reason to expect good shooting. Men going on duty at the same spot, firing at the same ranges and over the same ground day after day, and yet the shooting was not good. Both Russians and Roumanians seem to have taken it for granted, that there should be an indiscriminate blaze at nothing on occasions; and the Turks, judging by their practice, laid it down as a rule, that certain ground was to be swept with bullets, and so kept shooting over it whether any one was on it or not. I could hear of no case where one or two men have stood their ground against superior numbers in virtue of good shooting. A Turk went into the trenches with ammunition in his pouches, and in his pockets, and in the breast of his coat were little places made to hold cartridges after the manner of a Circassian. In his hand he carried a handkerchief or small sack filled with cartridges. With regard to the weapon, he used the Martini-Peabody. The distance it carries is marvellous, bullets were dug out of a hard clay threshing-floor from a depth of 6 inches at a distance of 2,000 yards from the nearest Turkish post. The weight of powder used is the same as ours, quality much the same, except that it has not so fine a glaze on it and it is consequently more liable to damp. The bullet weighs the same as that of the Henry-Martini, but it is of slightly less diameter and is a little longer. The allies soon found out that the Martini-Peabody was better than the Peabody, the Kranke, or Berdan, but the rifle above all others that they had the highest opinion of was the Winchester repeating rifle. So much did they think of it, that I have heard both Russians and Roumanians say that they considered a front attack against men armed with Winchesters hopeless. They looked on it as we have been taught to value a Gatling gun in a street or at a bridge head. I have it on the authority of an American General who supplied the Turks with ammunition that they had expended 240,000,000 rounds up to the fall of Plevna. There seems to have been no attempt made here or elsewhere of artificial obstacles by wire entanglement or other means.

The only occasion of using a light was when Skobeleff showed an illumination with "Kars is taken," in Turkish characters; this was shelled and shot to pieces in a very few minutes. I was told that the Russians had some sort of lime-light apparatus with them, which they intended to use in the event of a night sortie, but that the idea was abandoned on discovering how short a time the light would probably burn before being destroyed.

Wednesday, February 20th, 1878.

LIEUT.-GENERAL BEAUCHAMP WALKER, C.B., &c., &c., in the Chair.

PART II.

Battle of Plevna.—The horse-shoe shaped position of Plevna encloses the valley in which the Turks assembled prior to the sortie. A line drawn from Opanes to Plevna and from Plevna to the stone bridge shows two sides of the valley, the third is bounded by the Vid. Across the Vid to the west is a plain as level as a race-course; beyond this there is a slight rise up to the batteries in front of Etropol. It was on this plain and on this rise that the battle was fought. Across this plain about 1½ miles from the Vid runs the Russian infantry trench, further back a line of batteries, and behind them another. (Fig. 10.)

These three lines curve round, meeting the Roumanian lines that run from Sussulu and joining to Skobeleff's position across the Vid some 3 miles up stream. What actual number of guns were brought to bear by the Russians on the 10th I do not know; but 10 days before the sortie, the weakest spot by the Sofia road was swept by a converging fire of 62 guns.

As to what occurred in Plevna before the sortie, one of course has to depend on the evidence of the Turks. Mr. Kennedy had much conversation with Edhem Pasha, and this is his account, considerably condensed, of what took place at and immediately before the battle.

Shortly previous to the sortie a council of war was held, consisting of eight Pashas and the civil powers. Osman Pasha informed them that his store of bread was coming to an end, and that very little big gun ammunition was left. It was for them to decide whether they should lay down their arms or make a sortie in the only practicable place, across the Vid north of the Sofia road. The sortie was decided on. On the night of the 9th, 32,000 Turks, all the available force except a skeleton garrison for some of the redoubts, assembled in the valley of Plevna—26,000 infantry, 6,000 artillery. At two o'clock, this army commenced crossing the Vid by five bridges, viz., the permanent stone, and four temporary ones. The temporary bridges were placed, one just up stream to the south of the stone bridge, the other three dividing the distance between the stone bridge and a line drawn from Opanes fort straight to the river. As the regiments crossed the Vid they deployed into line, and they did this in so orderly a manner that the Cossack vedettes, who were but 300 yards away, were not aware of their vicinity till the skirmishers of the Turks advanced to within 100 yards of them. The Cossacks then retired firing. At this time the position of the Turkish forces was as follows:—1st, a line of skirmishers; 2nd, a line of battalions in line; 3rd, three guns in rear of right of line of infantry; three ditto centre ditto; three ditto left ditto. These guns were not used till after passing the first Russian

line. The Turks depended on one gun in the small bastion below Opanes redoubt, five on the south slope of the Opanes redoubt, these constituting the right of the Turkish attack; eleven guns in two batteries on the high ground on the Plevna side of the permanent bridge, these constituting the left of the Turkish attack. The positions of the Turkish Generals were as follows:—Commencing from the rear of the army one Pasha was on the high ground above the bridge with the eleven guns I have mentioned; one on the right, with the six guns on the slope of Opanes; two in the plain below superintending the crossing. On the right of the attacking line was one Pasha; in the centre, one; on the left, were two and Osman Pasha. As the attacking line advanced, carts containing ammunition and necessary baggage crossed the permanent bridge, and with them numbers of carts belonging to the inhabitants of Plevna, and containing their wives, children, and household goods, in all to the number of 4,000, pressed forward, and crossed as fast as possible. These latter Osman Pasha was powerless to prevent crossing, for as soon as his troops were withdrawn from Plevna they insisted on following. At daybreak, a little before eight, the fighting began. The bridge was swept by the Russian artillery, killing men, women, and children, horses and oxen. At nine, No. 2 bridge, counting the bridge below Opanes as No. 1, was broken by the Roumanian battery of five guns, situated to the right of the Turkish attack. The Turks steadily advanced, and carried the first Russian lines. Again they advanced, and carried two batteries of six guns each in the second line. For two hours the fight raged between the second and third line of the Russians in favour of neither side. At this critical time the Turkish shells ran short; this enabled the Roumanians to turn their left flank, to get possession of Opanes, and the hard-fought day was decided against the Turks. Osman Pasha was wounded in the leg, the same bullet killing his horse, a present from the Sultan. Ten thousand Turks had not crossed the Vid when they laid down their arms.

The first part of this account is evidently a repetition of the orders issued, showing how the attack was to be conducted. The reason given that the Turkish shells running short affected the issue of the battle can scarcely hold water, seeing how little shells from position-guns safely established in batteries, were able to effect during the siege, it is not likely that a few field guns which the Turks admit did not fire till they were past the first Russian lines could do much harm to the Russian guns or men in position.

When the Turks got to the furthest point to which they were able to carry the advance, Edhem Pasha says the fight raged for two hours, without favour to either side. How true this was that the fight raged fiercely, is proved by the fact that of the garrison of the two batteries taken by the Turks, not a Russian was left alive; they died like brave men, fighting for their guns. Long after the Turks were forced to retire, fighting went on, the Turks retiring to the high bank of the Vid, and there keeping up rifle fire. I think we may safely say that the battle must have been virtually over when the Turk appeared with the flag of truce at Opanes. And now to mark the progress of the battle

by the tokens left on the field. The plain between Plevna and the Vid was strewn with accoutrements, arms, knapsacks, ammunition, both for rifle and big gun. Many dead horses and a few dead men, principally those who had been wounded in the sortie, and in dragging themselves back towards Plevna, had succumbed on the way. A handful of parched grain thrown on the ground beside an open cartridge-pouch showed where each Turk had literally thrown down his arms. The amount of ammunition, according to the orders issued, to be carried by each Turk at the sortie was 90 rounds, but many carried a great deal more, judging from the ammunition thrown away. There were havresacks, pocket-handkerchiefs, cartridge belts, lying about filled with cartridges, besides the regulation pouches. The effect of the breaking of the bridge was most disastrous to the Turks. Judging by the way the killed lay, the extra work seems to have been thrown on the bridge lowest down stream, the result being that they do not seem to have deployed again properly, but became massed on the right of the line. When the Turks got to within 500 yards of the two batteries they took later in the day, the shrapnel and shell began to tell fearfully. Groups of dead, of 20 or 30, mark their advance, seemingly all killed by the same discharge. The ground everywhere was scored with shell marks, but the places where they told most was on the right, where the troops were massed; and on the left, where the shell had hard ground to burst on, viz., the road and stone bridge. The number of dead was increased here by the drivers and occupants of carts that were on the road.

Whatever may be the opinion about shells *versus* earthworks, there can be no doubt of the terrible execution wrought on men in the open, when massed together, and nowhere can a lesson of the value of steady drill be found than here. Troops in the open attacking men in earthworks, packed so tightly as to be unable to use their rifle fire, and with not sufficient drill power among them to deploy, and so remedy the harm worked by the one lucky Roumanian shell that broke the bridge.

Giurgevo and Ruschuck (See Fig. 8).—The town of Giurgevo has been very much knocked about by shells, and offers a good study of the effects of shell-fire on different materials. Where small mud hovels have been struck, scarcely any damage has been done, the shell having passed through the slender wall or roof, and not exploded till buried in the ground. Among the larger and more solidly-built structures are numerous examples of shell power. Notably in the case of a school, a large white building, standing on the high ground above the Danube; some 15 or 16 shots have completely wrecked it. 100 yards or so off is a quadrangle, the entrance to which is through an archway, rendered massive by the large timbers that support a room overhead. One shell passing through this room had burst on the centre of the arch, the whole of the timbers had been splintered, leaving an oval-shaped hole, about 10 feet in length and 6 feet broad.

Emerging from the town the high road runs westward, on an em-

bankment by the Danube, towards Slabosia. A chain of sentries showed clearly out, black patches on the snow. In rear of them at intervals are three rifles, with fixed bayonets, piled, apparently put out to take care of themselves in the open plain. As we approach the first pile, out pops a soldier's head from the ground, and we find each relief has got a cunningly constructed underground shelter, not very large, certainly, but, what is of more importance, very warm. Most of these shelters have been dug out of the reverse slope of a small bank, but some are in the open, and are made somewhat like the huts I have already described, the earth being dug out, a few beams placed across the hole thus made, branches on the beams, maize stalks on the branches, and the dug-out earth on the top; the earth is dug away on the reverse side sufficiently to admit of steps or a ramp leading down to the shelter; in the door is a bit of oiled paper for a window; the chimney is of clay.

All signs of these shelters had been obliterated by the 3 feet of snow that covered everything. The snow had completely changed the appearance of the batteries. The lines of the parapet and embrasures were all so toned down that one scarcely recognised them, and if it had not been for the well-swept paths and gun platforms, you might have walked into a battery before you knew of its existence. Approached from the other side, that is the front, you saw what appeared to be a gently sloping snow-covered hill. We went straight through the battery, and on the crest of the parapet on the extreme right front we are shown a little hole, about 3 feet deep. "My post," says the Colonel, "this is where I always sit when important firing is "going on."

We were in the centre of a line of 64 guns, 16 batteries of 4 guns each. (Fig. 8.) Battery No. 7 was the most advanced one; those on the right and left bending gradually back, following the turn of the Danube. The distance hence to the nearest Turkish battery was 2,000 metres. It seemed less, the mosques, minarets, and big buildings standing out clearly, though the day was far from a bright one, and the sounds of dogs barking and men shouting, came plainly across the water. I was told they could sometimes hear the word of command to fire in the Turkish battery opposite. Immediately below the line of Russian batteries which occupy the high ground was a shallow stream, frozen over, part of the Danube. Further towards Ruschuck was an island about 5 kilometres long. This was covered with wood, was always marshy, and in floods inundated. Behind this comes the Danube proper, a swift running stream, 600 yards broad. On the Ruschuck side, the ground rises suddenly from the water's edge, so the Turkish batteries are for the most part close to the river. On the south-west of the town the cliffs rise almost precipitously, and on this high ground were two batteries of field artillery, which have done the Turks good service.

The Russian Officers said that the straight shooting of these guns was marvellous, and they were naturally curious to know who commanded them. One reason why these light guns were felt by the Russians was that their central battery was pushed very far forward

indeed, so as to get to the extreme limit of the high ground, consequently the two Turkish field batteries took it almost in flank. There was a shell crater inside the parapet, and just above a gun in No. 7 Battery, which showed from the angle at which the shot had struck that the battery was too far out of the general line. With regard to the shooting of the Turkish artillery generally, the difference on different days was very marked, sometimes very wild, and on occasions very accurate. This pointed to their being some good Officer who occasionally directed. The Russian shooting had been very good. They put up a battery at Giurgevo to keep down the fire of the "Round Battery," the extreme right battery of the Turkish position, which had been doing a good deal of harm in the town of Giurgevo, and in one day dismounted its guns, and gave the Turks so good an opinion of their skill, that the round battery was not again occupied. The Turks also had a screened battery. A lucky Russian shell set the screen on fire, and burnt it down. This burning, however, proved a doubtful advantage, as the Turks fired away from the opened battery. The Russian guns comprised 8-inch howitzers, 6-inch steel guns, and 6-inch bronze guns, all breech-loading. The howitzers were sighted by means of a quadrant placed on the trunnion of the gun. The 6-inch guns were furnished with range-finders, and were sighted at the side. The way these guns were kept was beyond all praise. One man moved the massive breech-block of the howitzer, the smooth polished cartridge chamber and the rifled part of the barrel shone like silver, and were as clean as they could be. The moment a gun was cleaned after cease firing sounded, a water-proof tarred canvas case was put on it, and a stopper placed on the muzzle to keep out the damp. The Officer commanding considered his 8-inch howitzer the best gun in the world of its sort. His opinion is one of weight. For four years he worked at Birmingham, for two years in America, in peace-time he is the head of a steam engine and gun factory in Siberia, and now, once more called upon to serve, he became a leader of men, and as good at practice in war as at theories in peace-time. The range of his guns, he said, nobody knew. The 6-inch bronze gun especially would carry marvellous distances. The Russians were only using percussion shells. There was an array of Turkish ones that had been picked up unexploded, and had their charges drawn, mostly percussion, but a few time-fuze. Some very much out-of-date ones were fired off at the commencement of the bombardment, and were evidently got rid of as fast as possible. When I was there, the Turks were mostly firing Krupp shells of smaller calibre than those used by the Russians. This, however, was no proof that they had no larger guns because they had not fired them off, and it is quite possible that inside Ruschuck have been found 8-inch guns placed where one would expect to find them, viz., on the weakest side of the town, that is, provided they have not buried them, as they did some position guns at Plevna. The central Battery No. 7 was a "sunk" one of four 8-inch howitzers (Fig. 9). The four guns were placed on platforms about 5 feet below the general level of the ground, and about 20 yards apart; between each gun was left a solid ridge of earth as a

traverse. This traverse, if necessary, was built up to 12 or 14 feet high, revetted with sods. Beneath the traverses were shelters and magazines for a few rounds only. The inside of the embrasures and gun-pit, and lower part of traverses were revetted with hurdle-work very neatly put together, the stakes used being quite 2 inches in diameter. The hurdle-work was carried up to a height of nearly 5 feet. Around each traverse, and in all places where men had to move, trenches were cut about 5 feet deep, so as to ensure as much as possible the safety of all. In front and on the flanks of the line in which the guns stood, and at a distance of about 120 yards, was a solid earthen parapet about 20 feet thick, revetted with gabions; this acted as a screen. The ditch between the parapet and the sunk pits in which stood the guns, was cut down perfectly straight with steps cut in places to get down by. Aim was taken by small pointed sticks placed in the ground on the crest of the parapet. The trench that ran round the traverses was continued beyond the outer gun of each battery, and on the side of the trench next the front, were dug little cabins. These being dug out of the solid earth were, of course, perfectly safe. The only difference between the howitzer batteries and the 6-inch ones was that the embrasures of the latter were a little more cut away. There were always three look-out men when firing was going on; one with a telescope on a tripod to note the effect of the shots of his own battery; one to watch the jets of smoke from the battery opposed to it, so as to give timely notice of the coming shell, and the usual sentry to keep everybody out of the way except those on duty. The effect of these men really doing what they were set to do, and the effect of keeping every man not on duty under cover, was that the Russian losses were wonderfully small, 24 killed. The number of wounded I could not find out.

The distance the 16 batteries were spread over, was 13 kilometres ($8\frac{1}{10}$ miles).

Coming back to our standpoint at No. 7 Battery, we have 4 miles occupied by guns on each side. In front, and close to, is a line of pickets and sentries, further on, at the edge of the wood, is another line; again, nearer Ruschuck on the river bank, is the third and most advanced line. Behind us, in a circle that runs to the front of Giurgevo on the one side, to the end of the line of guns at the other, are tall poles standing in twos, placed in the best positions for being seen. Round these poles are twisted tarred straw bands; these are the beacon posts. Behind again, and at a distance of 4 miles, is the reserve, a regular little army—

Of 4 infantry battalions, say	750	= 3,000
„ 2 cavalry „	600	= 1,200
„ 2 batteries field artillery, 8 guns each ..	..	..
„ 1 company engineers, 100 men		100
		4,300

4,300 men and 16 guns.

The order for the commander of the beacon posts was to light his beacon if the enemy approached, so that the reserve could get quickly

up to the right spot. The posts were probably put up in anticipation of Turkish raids when the Danube was frozen over. The fighting, as it then was, consisted generally of a duel between two batteries, the Russians always beginning it, and the Turks replying shot for shot. The latter also got through a certain amount of rifle ammunition, firing across the river at the sentries; they also occasionally fired canister at the soldiers sent to cut wood on the island. I watched the bombardment from a very good position, where I could see the effect of shells from both sides. The practice was certainly very good, especially that of the Turks, shells frequently catching just the crest of the parapet. I also went down to the river, and had a good look at the Turkish line of sentries through a glass, and came to the conclusion from their movements that they were short of clothes. I watched several of them that lined the curved river bank down stream of Ruschuck, and every one of these men betrayed symptoms of cold. I then looked at the Russian lines, and found the men walking about in their usual leisurely fashion. The importance of this cannot be overrated. One man comes off his post fresh and well, ready to eat, sleep, and be watchful again; the other has to contend with a regular drain on his constitution, and every fresh exposure renders him less able to bear the next, till at last you heard of a case such as was reported the day I arrived at Giurgevo, a Turkish outpost of eight men frozen to death.

And now a word about a Russian soldier's clothes.

His sheepskin coat with the wool inside is slit down at the neck sufficiently far for him to pull it on, this slit buttoning up high when on. It fits him tight about the waist, the skirts made like those of a frock coat reach to the calf of his leg. His boots, particularly well made, reach above his knees. His gloves are good warm woollen ones, but with only a thumb to them, the place for his fingers being a kind of bag. Instead of socks, he has a triangular shaped piece of canvas stuff that he rolls round his foot, this in spite of the clumsiness of its appearance seems to answer well. I could find no men suffering from sore feet. I must add, however, that most troops at this time were stationary, so my experience is not worth much. The garment above all others that he seems to value most is his hood. This hood has long ends to it, and is made of a thick, soft, warm stuff, brown in colour, having the appearance of felt. Its uses are numerous. The soldier uses it as a comforter, the two long ends coming under his arms and tied round his waist. Getting a little colder he folds the hood flat and puts the garment on so that the flat hood stands up at the back of his head and protects his ears, the ends still being long enough to tie round his waist. Lastly, he puts the hood on, brings the ends twice round his neck and ties them there; in this state you have to bend down to about his waist belt and look upwards if you want to see his face at all.

Condition of Transport between Bucharest and Sistova on 8th January, when the Danube was full of ice but not frozen over.

After the breaking of the bridges between Sistova and Zimnitza,

communication was kept up by pontoons rowed by sailors. The river was full of ice, which rendered this service a dangerous one. Seventeen persons were drowned on the 8th attempting the passage in a private boat. The trip formerly occupying about 15 to 30 minutes took then from one to three hours, sometimes even longer. The pontoons were crowded with Officers on duty, and deeply laden with money in boxes and sheepskin coats. No other goods were taken. On 6th and 7th January, fog interrupted this traffic, and it was often interrupted by the same cause. What everybody hoped for was hard frost to freeze the Danube over, and so allow of the full passage of the stores the Russian Army so urgently needed. Enormous quantities of provisions and clothing were stacked in Zimnitza, carts daily arriving with more. Hay was not to be bought; the draft cattle fed alone on Indian corn died in great numbers, and the difficulties, always great of transporting supplies from the railway at Frateshti and Giurgevo, were increased greatly by this cause alone? The principle upon which animals were worked here was simply to work them to death. Every street and lane in Zimnitza was strewn with dead ponies and bullocks; ponies mere skin and bone, unable to do a day's more work, were turned adrift on the snow-covered plain to meet a certain, cruel, lingering death. The question arose, whence are the ranks daily thinned of draught cattle, to be filled. Carts from all the surrounding countries were then to be seen in Zimnitza. Bulgaria, Bessarabia, Hungaria, Wallachia, Moldavia, were all represented by both man and beast. Carters unable to fulfil their contracts of delivering their loads in Sistova, and ruined by the war prices, daily ran away, leaving the contractors under whom they worked, losers by reason of the large advances already made them. In the railway station at Bucharest at this time was an enormous number of sacks containing bread and biscuit. Sheepskin coats made in Russia for the army and sent away thence two months before, had not only not been delivered in Bucharest, but it was not known where they were, so great was the confusion. All these things had to be forwarded by the carts I have alluded to, as at Zimnitza or on the road between Frateshti and that place, or else by the new line of railway just constructed between these two places. With regard to the old railway that runs between Bucharest and Giurgevo, in two places it was so exposed, that the slightest wind drifted the snow over the line, and made it impassable. The engines were old, almost worn out, some of the worst having leaky boilers, so that in the distance to Frateshti from Bucharest, 35 miles, the engine has often to leave the train to go in search of water. The passenger train that left Bucharest for Frateshti at 9.30 A.M. on the 7th took 15 hours to do the journey. The train that left Giurgevo at 6 P.M. on the 8th arrived at Bucharest at 9.30 A.M. on the 9th. This describes the railway communications.

I have confined myself to the northern side of the Danube, the difficulties increased in an increasing ratio as each cart or sleigh drew its load further into Bulgaria.

Communications across the Danube at Petroshani and Nicopolis were also by boat at this time.

LECTURE.

Friday, March 29th, 1878.

LIEUT.-GENERAL W. M. SCOTT McMURDO, C.B., in the Chair.

ON THE EMPLOYMENT OF THE RESERVE FORCES IN CASE OF AN EXPEDITIONARY FORCE BEING SENT ABROAD.

By Colonel H. C. FLETCHER, C.M.G., Commanding 2nd Battalion Scots Guards.

THERE is a well-known proverb, *qui s'excuse s'accuse*, and at the risk of having it applied to myself, I must preface this paper by saying that I can put forward little that is new, or that has not been thoroughly considered by those whose duty it is to make the necessary preparations for war, on paper, if not in a more practical manner. All that relates to the defence of Great Britain, has been dealt with in various books and pamphlets and formularised into plans more or less feasible, and little remains for me except to lay before you a digest of other people's thoughts, and to endeavour to present a picture of the state of affairs that would arise if England were engaged in serious war.

Let us therefore endeavour to realise the condition of the country soon after war had been declared with a powerful European nation, and for the sake of argument and without prejudice let us suppose that nation to be Russia. Two army corps, comprising the whole of the regular forces of England and Ireland, excepting the skeletons of a few battalions, including six battalions of Guards, and a regiment or two of Household Cavalry, and made up of the Army reserve, and a large portion of what is called the Militia reserve, have left for the East. There are 10,000 men on their way from Canada, and the advanced corps of a force of 80,000 native Indian tooops are passing through the Suez Canal. The country is denuded of regular troops, and their ordinary work, as well as the task of providing reinforcements, is falling on the Reserve forces and on those who are left in charge of the various districts into which the country has been divided. Little or no analogy can be deduced from what was done during the Crimean war. At that time we drifted into a state of hostilities after a long peace, with but little or no prepara-

tion, and without recognising the latent power which a country possessing the population and wealth of England, can put forth. We fought our battles with a small body of regular troops, helped indirectly by the Militia, who garrisoned the fortresses in the Mediterranean, maintained a respectable armed force at home, and whose Officers worked nobly and unselfishly in providing recruits to repair the losses of the regular troops. As the war went on we had recourse to shifts and expedients which I scarcely think creditable to a great country. We sent to Germany, Switzerland, and Italy to hire mercenaries, whilst we neglected to utilize the large and I may say warlike population of our own Isles, not apparently imagining that soldiers could be procured by other methods than those which obtained during our wars in Spain and in America. In thus acting we, however, only followed former precedents. Indeed, to quote from "Clode's Military "Forces of the Crown," no Continental war was ever previously carried on with so small a number of foreign troops. The idea seems to have been that armies were to be recruited solely from the lower classes; that soldiers should be purchased in the cheapest market, and—provided they reached to a fixed and certainly not high standard of physical qualities—that it was a matter of indifference whether they were fighting for a cause in which they were interested, or merely for their pay. Happily for us, the brunt of the struggle fell on our own brave national troops, and notwithstanding the many disadvantages under which they laboured owing to the neglect of the Army by the nation during the years that followed the fall of Napoleon, they manfully upheld their ancient renown, and brought us out of difficulties that it would be most unwise to incur again.

The ideas of the scale on which war can be conducted have changed since the Crimean days. Nations have learnt that by proper organization, and by the use of the many mechanical means which this century has produced, armies of a size unknown in former European history can be brought rapidly from distant points to the scenes of operation, and can be maintained with little reference to the seasons of the year, or to the resources of the country which may be the theatre of the campaign. War is no longer the affair of the upper classes as leaders, and of the lower as soldiers—all ranks and all conditions must take part in it, whether forced to do so by the iron rule of conscription, or propelled by the influences that free countries like England and America should know how to exert when a great national struggle stirs to the depths the patriotic feelings of the citizens. If we refuse to imitate the practice of continental nations, we may still take a lesson from the gigantic efforts made by the Northern and Southern States during the Civil War of America, and we may gather from a study of those campaigns, examples, or rather warnings, of the necessity of realizing at the commencement of a struggle the efforts requisite for conducting it to its ultimate end, and the losses in men, money, and honour, that will flow from neglecting to put forth the national energies at the outset of a war.

Before proceeding further, it will be well to come to some understanding as to the land forces on which England would have to rely.

We have at home, according to returns based on the Army estimates,

Standing army	90,000
Army and militia reserves ..	38,000
Militia	85,000
Effective volunteers	180,000
Second class army reserves ..	23,500
Yeomanry	10,000
Total ..	426,500

And we learn from Mr. Gathorne Hardy in his speech on moving the Army estimates that he looks upon 400,000 men as the basis of our military establishment. It will, therefore, be allowable to take these figures as representing approximately the home forces with which we should commence war. In India we have 63,000 European, and 120,000 native troops, besides contingents, which (paid by semi-independent Princes) might be attracted to our service. We have also the resources of our great colonies, who, if England were seriously committed to war, would not be content to be mere lookers-on of the struggle of the parent State. From Canada we might, I believe, reckon on 10,000 infantry, a regiment of cavalry, and two batteries of artillery, and at least a company of engineers, as a first instalment, which her own warlike population, supplemented by the many restless spirits of English birth from the adjoining great Republic, would easily keep up, if they did not increase.

As the actual commencement of hostile operations on land would depend on us, and as even the theatre of the campaign would also be open to our selection, the strength, composition, and time of sending abroad an expeditionary force would in great measure be influenced by England's preparation for war. Efforts are now being made to get ready for the field two army corps of 74,000 Officers and men. To do this, thirty-nine battalions of the Line, and three of the Guards would have to be sent, and these battalions, after being weeded of youths who have not completed eight months' service, would require, to bring them up to war strength, about eighteen thousand five hundred (18,500) men, who would have to be drawn from the Army reserves, the Militia reserves, and from the 35 battalions of Guards and Line who would still remain after the departure of the two corps. These home battalions would consequently be greatly attenuated in numbers, even although they had received into their ranks the younger soldiers of the war battalions. Therefore, to complete them, 23,000 men would be required, whilst, to bring up the 109 Militia battalions to war strength, 50,700 would have to be raised. In all, without counting India and the Colonies, nearly 74,000 infantry recruits and 4,000 cavalry and artillery recruits would have to be found with as little delay as possible. But these numbers do not represent the strain that would on the outbreak of hostilities fall almost immediately on the population. The losses of war would have to be met, and our Indian Army supplied. For the former 75 per cent. of

the number in the field is considered to be a fair annual proportion' therefore to maintain in the field 60,000 men, an annual supply of 45,000 becomes requisite, whilst the average number for India and the Colonies would be 8,000. Considerably more than 100,000 recruits would therefore have to be obtained in the first year, in order to complete and keep up two *corps d'armée*, and to maintain the Militia (which would be the reserve as well as the training school of the troops in the field), and to afford the ordinary drafts to India and the Colonies. We must therefore imagine our quiet and somewhat sleepy brigade-depôts in full working order, recruits constantly pouring in, being provided with arms, clothing, and accoutrements, and then passed on to the affiliated Militia battalions, who would probably occupy the barracks and quarters of the absent troops of the Line. Aldershot, the great training school of the country, would afford permanent accommodation for a large number, whilst during the summer months additional troops would be placed under canvas. Other stations would be selected for camps of instruction, their localities being fixed in great measure with reference to the enemy with whom we might be engaged. If there appeared any possibility of invasion, our Southern and Eastern districts would necessarily monopolize the larger portion of our home Army, and the conveniences of localities for training local troops would have to give way to the general scheme of defence.

The memorandum on Mobilization drawn up for the Government, divides the home Army into six corps for England, one for Ireland, and one for Scotland; four of these corps being allotted to the southern counties of England. These corps comprise regular troops, Militia, Volunteers, and Pensioners, who would be stationed in permanent camps, in our fortresses, and in the case of the coast volunteers as near as possible to the localities to which they belong; whilst a large entrenched camp near London would probably be the head training station of the Metropolitan forces.[1] If the war were between ourselves and an enemy not possessed of naval power, the necessities of protection from invasion might give way to the advantages of localizing our forces. The loss of labour consequent on the withdrawal of so many men from their ordinary pursuits would entail much inconvenience; and if military training could be so arranged as to permit of a large proportion of the force being on leave during the seasons of the year when agricultural labour is most required, considerable saving in the waste of the wealth of the country might be effected. In the same way with the Volunteers. The embodiment of portions of regiments would be necessary, not only that garrison duties should be properly carried on, but for purposes of discipline, as men must be brought together somewhat permanently under their Officers and non-commissioned officers in order to acquire the cohesion requisite for a military force.

Arrangements might doubtless be made for the garrison duties to be

[1] The mobilization scheme provides for the full employment of the Volunteer force. In addition to the garrisons which would have to be furnished for the fortified places, the coast volunteers organized into brigades would oppose the enemy on first landing, falling back on the positions selected for defence.

performed week about by certain regiments or companies of Volunteers, as it is most important that the young troops who are being trained as reinforcements for the Army in the field should not waste their time and injure their health by performing the routine of what soldiers call *sentry go*. They require their days for military exercises, for drill, for shooting, for outpost duties, and for instruction in the various requirements of a soldier on service; and, consequently, they must be relieved from garrison duty, and not be expected to be trained, like the drafts for the Guards' regiments, during the Crimean War, in the midst of a great city and with *three nights in bed*. The volunteers of our cities and of our garrison towns might be most useful in affording this relief to the young soldiers of the regular Army and of the Militia, in addition to the drill and exercises which those not on duty might undertake daily by a proper distribution of time. For it must be remembered that a serious war will change ideas in regard to relaxation, and mere amusement will have to give way to the relief which an alteration in work affords. Many of our clerks, shopkeepers, and citizens could afford an hour daily after the termination of their ordinary work, if the places of training were sufficiently near; whilst a well organized system of Sunday parades would not only give fifty-two additional drills in the year, but would often tend to the better keeping of the day.

Thus, whilst our garrisons in the Mediterranean are occupied by Militia to be fed from their depôts; whilst our fortified places at home have also received Militia and local Volunteers in place of regular troops; whilst large camps have been established at convenient places for the receipt of recruits from the brigade depôts, and for the better training of temporarily embodied regiments of Volunteers, every means should be taken to find places and to arrange time so that the Volunteers of the great cities should have the advantage of drill *pari passu* with their regular work. It will be in the recollection of many who are still living, that the fear of invasion at the commencement of the present century gave rise to a similar state of affairs. Then the great mercantile establishments raised, trained, and officered companies of Volunteers. Men did their work in life like the Jews described in the Book of Judges, with their weapons ready at hand. Besides Militia which were permanently embodied, and which possessed the qualities of regular troops, there were in England alone, in 1805, 350,000 Volunteers, comprising cavalry, artillery, and infantry. These were regularly reported on by the Generals of the districts, and on the whole their reports were very favourable—"fit to take their place with troops of the line" being the usual observation in the columns of remarks.

It will not be out of place if we glance at the work performed by what are now termed the Reserve forces, during the close of the last and the commencement of the present century. To quote from Raike's "Reserve Forces," out of 80,626 militiamen, in the year 1798, 15,712 volunteered to serve under Sir Ralph Abercrombie, and shortly afterwards 10,414 joined the regular Army. In 1808, 30,883 men were obtained for the Army from the Militia, whilst in 1813, the Officers and men of the Militia were allowed to volunteer into the Army or to serve as Militia with the Army abroad, the battalions and regiments of

Militia being under their own field officers. In 1800, as much as 60*l.* is said to have been paid at Plymouth for a substitute, whilst one man went on condition of receiving four shillings a day, and another sold himself for seven and threepence a pound. A general Militia Act was passed in 1802, by which men between the ages of 18 and 45 were to be raised by ballot, and to pay a fine of 10*l.* to be exempt for five years. In 1808, a local militia was raised, and 214,000 men were obtained by ballot, no substitutes being allowed. During the Peninsular War, besides furnishing Officers and men to the Army, the Militia served *quâ* militia in Portugal, whilst they sent large quotas to the army that fought at Waterloo. At the time of the Crimean War, the Militia furnished from 25,000 to 30,000 men for the line, whilst 50 regiments, representing nearly 41,000 men, volunteered for foreign service, and of these ten regiments were selected to serve at Mediterranean stations; during the Indian Mutiny also, 18 regiments offered themselves for service abroad.

In addition to the Militia, large numbers of volunteers were raised under the Defence Act of 1802, which was subsequently amended by the Levy en Masse Act, when 420,000 men volunteered partly to escape the ballot for the Militia. In 1804 and in the four subsequent years, the number of volunteers in Great Britain averaged about 350,000, Ireland furnishing 70,000. A portion of this force received pay up to 1806, after which date, arms only were issued, as it was found that men who ought to have been serving in the regular Army or the Militia, had enrolled themselves in the Volunteers. It is difficult to arrive at the exact numbers, as they of course varied from year to year. To quote from statistics compiled by General T. B. Collinson, from records in the Quartermaster-General's office, and brought under the notice of this Institution in his admirable paper entitled "Another Warning Voice from 1805," it appears that in November, 1803, there were 327,286 volunteers under arms, whilst two years later (and the numbers were probably nearly the same as those in 1803) there was a force of 9,622 regular artillery, 12,984 cavalry, 47,116 infantry, 56,316 militia, making a total of 126,028 regulars and militia, or a grand total of upwards of 450,000 men under arms in Great Britain alone, of which the population was less than half what it is at the present time. I mention these numbers as giving an idea of what this country can do under the pressure of a serious crisis and of a great war, although I cannot help agreeing with Mr. Burke, who, denouncing this timid policy, says, "Who would have "credited that 200,000 men were kept in England and 80,000 in Ireland for the mere purpose of an inert and passive defence, and that by its very constitution the greater part of this force was disabled from defending us against the enemy by one preventive stroke of active hostility?"

It is partly with the view of directing attention, not only to the effort this country is capable of, but also to the blot in a system which keeps so large a portion of the Army from fighting beyond the shores of Great Britain, that I have brought the subject of the employment of the Reserve forces under your notice.

There is no more false economy than that of stinting military operations at the commencement of war, or of failing thoroughly to recognise the gravity of the occasion and the necessity of sacrificing preconceived notions and individual interests to a mighty and sustained effort.

In well ordered and systematically governed countries it is always a difficult matter to induce departments to take broad and unaccustomed views of subjects, the details of which engross their daily attention. The very excellence of the organization of Government Departments, and the very zeal of the employés, may even detract from their ability to meet an unexpected strain. There is a tendency to lose sight of great objects and to work for narrow aims instead of for the general good. The heads of departments are probably free from prejudices, and are anxious to push the coach on; but those who grease the wheels do not work heartily with those who repair the harness, whilst the road makers, intent on the excellence of their roads, cannot be induced to prepare rough-and-ready tracks for temporary and exceptional use. In England there are immense resources for war, but these resources cannot be utilized without changes in the organization of our military establishments, which are doubtless suited for dealing with the frequent small wars in which England is engaged, but which require elasticity to meet a great crisis. Napoleon's system, which in the height of his career he certainly pushed too far, of refusing to recognise any difficulties, and requiring his subordinates to carry out his plans without putting forward objections, has many merits, and might be copied with advantage in the administration of our military affairs. Boldness is essential not only in the conduct of armies in the field, but in the adoption of plans involving change, and a departure from the accustomed grooves.

I hope, however, that if war break out, we should fully realize our position and that the end of the first month would see England converted into a great camp, recruits pouring into the depôts, camps of instruction in full swing, and the volunteer regiments, with higher standards of efficiency than at present, taking their turn in the regular military duties of the towns and garrisons, and furnishing large quotas in rotation for periodical training at the camps. Many of those who had left their ranks would rejoin the several corps to which they previously belonged, and active and energetic retired Officers of the Army would offer their services as instructors of the additional battalions and companies that would speedily be raised. The Yeomanry—converted in most instances into mounted riflemen—would give an outlet to the military instinct of the farmers, and afford no mean reserve to the cavalry, whilst it would be found almost impossible to check the formation of field batteries, which I feel confident might be sufficiently trained to act with infantry in the event of an invasion. The strain on society would at first be very great, but gradually we should accommodate ourselves to the new condition of affairs, and would be able to show foreign Governments an example of the latent energy possessed by a free country. The principal difficulty would be that of discovering the best method of

raising the number of men to fill the ranks of the regiments of the Line, and of the embodied Militia. If the country could be brought to acknowledge the necessity of a modified conscription, the task of recruiting would be greatly diminished. Once get the men by conscription into the Militia, and the Line could easily be fed from this source, whilst, as has been pointed out by Lord Elcho and others, the standard of efficiency of the Volunteers, supposing them to be exempt from the ballot, might be considerably raised. Merely by money inducements, whether given in the shape of pay, pension, or bounty, it would be a hard matter to raise the requisite numbers. The United States nearly succeeded in doing so, but towards the close of the war a man was worth £200; and the demoralization and abuses consequent on the offer of high bounties are so lamentable that almost any plan would be preferable to such a method of procuring recruits. It may be impossible to face this difficulty until the nation and the Government are brought face to face with it, but no pains should be spared in the preparation of some scheme that could readily and quickly be put into operation. If high bounties be once given, or if they be even expected, it will be a hard matter to withdraw this bribe to the class who would benefit by them, and a check to recruiting would be occasioned at the very time men were required. Far better at the outset of hostilities to place the whole matter fairly before the country, and to put in force the law now in abeyance of ballot for the Militia.

To return to the subject of the Reserve forces: it will doubtless have been observed, that throughout this paper the despatch of an expeditionary force of only two army corps has been contemplated, whereas England, with her population and wealth, ought to be able to keep in the field more than double that number, if any analogy is to be furnished from the efforts made by other nations. I believe it would be impossible as war went on, and as men warmed to the work, to check the enthusiasm of the Reserve forces. They would not be content to see their comrades of the line engaged in the field, and they themselves kept in garrison and in camp. During the Crimean War, the regiments of militia at Corfu and Malta would have willingly volunteered to join the army before Sebastopol. Much more now, when military knowledge and military feeling have been spread throughout the country, and when all classes, even in peace-time, readily bear a portion of the burden which soldiering entails. It may be said that these regiments could send recruits to the Line; doubtless they would do so; but if their services were accepted as regiments, far larger numbers would volunteer; and if universal conscription is to be avoided, every channel must be thrown open by which troops are to be procured. Doubtless there are difficulties to be overcome and prejudices to be rooted up; but it would be a bitter satire on free institutions if it were said that England would not bear the burden of conscription, or show sufficient intelligence to adapt existing regulations to meet an abnormal condition of affairs. In the same way, the volunteers who form the outlet for the military energies of our middle classes, ought to have opportunities given them for service before the enemy. Their motto is, "Defence, not Defiance;" but Heaven forbid that England

should ever wage wars of defiance; she merely fights to defend her possessions, although to do so she must fight beyond the seas.

It is said that several regiments have already placed their services at the disposal of the Secretary of State for War, and it would probably be possible to raise from the effective volunteers a considerable force, and one which any Officer would be proud to command. A difficulty might arise in maintaining it without trenching on the recruiting grounds of the Army and the Militia; but if there were conscription for the latter, with inducements to enter the regular Army, and an exemption only in favour of efficient volunteers, the latter might maintain as well as furnish a representative force in the field.

As the war went on, much that appears now to be complicated would disappear, and a system once organized would either simplify itself or develop its impracticability. In the meantime, a force formed of the present efficient volunteers, and well officered, would not only add considerably to the strength of our army, but would be of political importance as evincing the earnestness of the people, and the readiness of classes not usually found in the ranks of the English Army, to take their part in the dangers of war.

A clear recognition of the distinct duties of the Reserve forces might prevent mistaken ideas, and lead to a simplification of plan. Their first duty, as has been pointed out, is to provide for the reinforcement of the troops in the field. From this, the volunteers, as volunteers, will be exempt, unless they were prepared to despatch a representative force, and act with the army abroad. The second duty of the reserve forces, is to be in readiness to take their place in the field in the event of additional *corps d'armée* being required, and then depôts must be provided for them, as well as for the regular Army. The system would remain the same, viz., recruits for the forces in the field joining at the several depôts, and being transferred from these depôts to the camps of instruction, previous to their embarking for service abroad; the work of garrisoning England would then fall exclusively on the troops retained permanently for home defence, and provided from the classes who could not devote their whole time to military work.

Thus the advice given by Mr. Pitt in his speech in Parliament on the Volunteer Act of 1803 would be followed:—"I was formerly," said Mr. Pitt, "and still am, of opinion that to a regular army alone, "however superior, however excellent, even aided by the militia, we "ought not solely to trust, but that in a moment so eventful, in a contest "so singular in its character, and which perhaps may be tedious in its "duration, we ought to superadd to the regular army some permanent "system of national defence, either to a certain degree compulsory, or "formed upon the voluntary zeal and patriotism of the country itself. "This ought to be resorted to as the grand source of domestic security. "The army must be the rallying point; the army must furnish example, "must afford instruction, must give the principles on which the national "system of defence must be formed, and by which the volunteer forces of "the country, though, in a military view, inferior to the regular army, "would, fighting on their own soil, for everything dear to individuals "and important to the State, be invincible."

There is still another duty which, though perhaps not coming directly within the scope of this paper, has so near a relation to the efficiency of an army raised from the body of the population, that I may be excused from alluding to it. If our Army and Militia reservemen (many of them being married) were called into the ranks; if the militia were to furnish large drafts to fill up the gaps of war; and if the volunteers contribute their quota, there must, owing to the prevalence of early marriages, be a very considerable number of women and children deprived of their natural supporters, and reduced to great straits for a livelihood. It is a grievous thing for a fighting man to think that his wife and little ones are in penury and want. It would militate greatly against voluntary enlistment if men felt that their absence would entail privations on their families, whilst an almost equal evil would be occasioned if indiscriminate charity were lavished on those who were left at home. There is, therefore, a vast field for organization and for systematic preparation, if the best method of assisting the wives and families of the men who would fight the nation's battles is to be arranged, and if the opposite evils of neglect and of unwise benevolence are to be avoided. Doubtless, much of the work now performed by men might, without undue tax on their strength, fall on the weaker sex, and it would be the duty of employers of labour to endeavour to discover how this arrangement could best be effected; but still there would be plenty of scope for charity, and a wide field in which those who do not actually fight the battles of the country may still labour to contribute to the national weal.[1]

In more than one way must the patriotism of the employers of labour be appealed to. If conscription is to be avoided, indirect as well as direct encouragement will have to be given to recruiting for the Army (and in this word I include the Reserve force). Nor, as at present, must some of our principal railways refuse to take reserve men, for fear lest they should be called on in case of any national emergency. The education and training of soldiers ought to be a passport to many of the situations where habits of order and discipline are essential. The railways, the police, the county constabularies, and the warderships of prisons would furnish employment for large number of men who have completed their three or six years in the ranks; and in the event of serious war, their places could, after a little while, in many instances be filled by those whom wounds and sickness might have incapacitated for active field service, and who would yet be fitted for less arduous work. Some sacrifices would doubtless have to be made, the luxury of perfectly performed work, and of a superabundance of labour might have to be foregone, and the public would have to bear with deficiencies which a great national war necessarily entails. To any-

[1] An announcement has just been made of the intention of the Government to call out the Army and Militia Reserves. The difficulty, therefore, of dealing with the wives and families of those who have to join the ranks should at once be met. The evils of affording them parish relief are so obvious that they do not require enumerating, but there are other ways in which assistance can be given, and policy, equally with justice, points to the necessity of at once meeting the difficulty, and of alleviating the distress which the withdrawal from their families of so many husbands and parents must necessarily cause.

one who travelled through the Confederate States during the Civil War, numerous instances will occur of the absence of the usual supply of labour, and of the inconveniences ensuing from such a condition of affairs, which were cheerfully borne by a people earnest in the cause to which they were committed.

I have endeavoured in this short paper not so much to lay down any definite duties for the Reserve forces, as to point out how much will be expected from them if England were to be drawn into war with a great Power. A prevalent idea among many persons appears to be, that,—secure in their island,—they will be able to look on at a war in which the regular army, assisted perhaps by a few of the more eager of the regiments of the Reserve will take part, and that, beyond paying an increased income-tax, they will have little personally to do with it or to suffer from it. To the majority of Englishmen this was the light in which the Crimean War presented itself. There was little outwardly to mark that England was engaged in an important struggle: the sentries on the palaces and public buildings were perhaps rather smaller and younger, and if anyone took the trouble of going to Aldershot he would have seen a large force of embodied militia, and at Shorncliffe some German mercenaries, but the ordinary life of the English people was not disturbed; everything went on as usual, and few thought of putting themselves even to inconvenience to assist in the prosecution of a war, waged far from our own shores, and not directly affecting every-day routine. But if the cloud which is now showing itself over the European horizon bursts in storm, the work that Englishmen will have to do will tax all their energies. It is a good sign that both in the Regulars, the Militia, and the Volunteers, recruiting improves as the reality of active service presents itself. It is encouraging to see the increased efforts which are being made by the volunteer regiments to raise their standard of efficiency, not only in what may gratify the eye, but in real essentials which even the regular troops are only beginning to recognise. The provision of regimental transport, and the best method of using it, together with the formation of ambulance corps, are attracting the attention of many of our volunteer regiments, whilst the fact alluded to by Mr. Hardy of the number of annual encampments is a proof of the zeal with which all that tends to the best method of military training is taken up and practised. So far so good, but more will probably be required. The necessity for conscription may have to be faced, and the country may have to show that the sneer against our young men from the city and from Manchester imputed to Prince Bismarck has no foundation, but that true civilization does not lead to effeminacy or to an evasion of dangerous duties. The thought of fighting our battles by means of extraneous aid, except merely as supplementary to the National forces, ought to be put aside. How can we ask Canada for help, if we do not avail ourselves of our own Reserve forces? Is it consistent with our dignity, or even with the safety of our Indian Empire to employ Asiatics, when Anglo-Saxons sit at home at ease reading the highly spiced narratives of newspaper war correspondents? We must fight our own battles, or fall as every empire has fallen that evades danger in the belief that gold can be a substitute for iron.

Lord Bacon, in his essay on the True Greatness of Kingdoms and States, gives the following counsel: "Walled towns, stored arsenals, and "armories, goodly races of horse chariots of war, elephants, ordnance, "artillery and the like—all this is like a sheep in a lion's skin, except "the breed and disposition of the people be stout and warlike. Nay, "number itself in armies importeth not much where the people are of "weak courage." Therefore, he continues, "let any Prince or State "think soberly of his forces, except the militia of natives be of good and "valiant soldiers; and let Princes on their side, that have subjects of "martial dispositions, know their own strength, unless they have been "otherwise wanting in themselves. As for mercenary forces, all ex- "amples show that, whatsoever Estate or Prince doth rest upon them, he "may spread his feathers for a time, but he will mew them soon after."

I should like to conclude this paper with one practical suggestion: If a volunteer brigade could be raised for service in the field, it would be well for those who would comprise it to place their services at the disposal of the Government for the forthcoming summer drills. It would then be seen of what good stuff such a body of troops was composed, whilst a fortnight's peace campaigning, and the intercourse with the staff under whom they would act, and with the troops alongside of whom they would serve and fight, would work wonders in welding the heterogeneous elements of which such a brigade would necessarily be composed, into a concrete and solid mass fit for any duty to which it might be put.

In foreign countries the impulse of action has to come from above—in England and America it is the people who push on the Government; and therefore at the present crisis, when war and peace are trembling in the balance, there is an opportunity for our Reserve forces, and for those who command them, to systematize schemes of improvement in, and to organize plans for, the employment of the vast latent power for war which England possesses, and which she ought to be able thoroughly to utilize.

Colonel Lord WAVENEY, F.R.S.: I rise to address this meeting at this early stage of the discussion on a special ground. It was my fortune to hear yesterday declared to the assembled Legislature of England the necessity of placing the Reserve Forces under arms, an event which probably will be one of the most remarkable of the last half of this century; and I find to day by an extraordinary coincidence to find that my gallant friend the lecturer has given us an insight into what the use of these Reserve Forces may be. In both cases there is an identity that is gratifying to every one who respects the self-restraint of the English people. The announcement in the Legislature was received in respectful silence, but certainly with reference to the enormous results that might be the consequence; and when we had recalled to us, and as I will in a few words show, for an excellent purpose, what has been of old by the Reserve Force, that announcement was also received with the silence of men who are not carried away by sudden floods of impulse or sentiment even on great occasions. I said it was of importance, because you may depend upon it at this moment every eye in Europe is fixed on the proceedings of public meetings in England, and this meeting in which the representatives of the two Services are gathered together, will have its comment in every newspaper on the Continent. I speak with certainty, and for this reason, that I have observed in the continental press for some time past a desire to depreciate the motive power, in military matters, of England; a misconception, but one which generally prevails, and therefore in

proportion to the business-like, soldierlike, calm way in which the question has been laid before us, and in which it will be treated, will be the new light that will be borne in upon those who are disposed to undervalue the military power of this country. And I say it is of importance also because you must bring all things to a mathematical foundation in military matters. Genius in a chief, zeal in an Officer, obedience in a soldier we may expect, but after all, the innate forces of the nation are those which are to be consulted. To illustrate this I am bold to say that, for Imperial purposes, the military forces of this country put in action in the true spirit and genius of British war makes us as formidable a military power as any in the world. What is the genius of British war? Expeditions supported by fleets, maintaining a communication with the home country, and supported again by Reserves. And there is a double preparation of Reserve which I see has been referred to in this lecture, that is to say, the Reserve of supply for the army in the field, or the army of operation, and the reserve of resistance, which is left at home for home purposes. With regard to the Reserve I have a very strong and decided opinion as to the means by which the general subject may best be treated. I believe it is better on all occasions to avoid a confusion of supply, so to speak. For instance, drawing men from one regiment into another, as has been recently done to the extent of 4,000 men in order to make up the first army corps. It would, I say, be better if each could be prepared in its own way and in its own line, for its particular service. This brings me to this point, that the principle of conscription in some shape or another is one which we shall be compelled to adopt, and in adopting it let us make it consentaneous with our spirit of aggregation in individuality—what is called so happily the *esprit de corps*. Let the Army have its own duties. I know that during the Indian Mutiny, militia regiments volunteered for foreign service, by which I understand for India.

To show the effect of the organization of the Militia Service so that it might be ready to volunteer for foreign service, let me state this, that during the Indian Mutiny my old soldiers came to me and said, "Sir, can't you take us against these "sepoys?" I said "No, I can't." Then they said, "What are we to do?" I said, "Why, there is the recruiting sergeant, you can go and join the regular Army," "No," they said, "we will go with our Officers and our old comrades, but we will "not go in the regular Army." I was very glad to hear what was said about Volunteers. The Volunteers are men of whom none can speak too highly for their zeal, their spirit, their intelligence, or for the way in which they take to hard work. I have not been a colonel of Volunteer Artillery, but I know the hard life that they have led for the short period that they were under canvas. I remember on two special occasions the Essex brigade had an excessively wearisome and unhealthy duty; they marched into camp for their four days' drill. The weather was wet, they pitched wet, they remained wet, the weather was bad the whole time, and of course they were not provided with the same means of resisting the weather as regular troops would have been. However, in spite of all these drawbacks and difficulties, the men did their work thoroughly well. Still a trial of that kind is too great a strain for men who are not accustomed to rough service in the field, and therefore I lay great stress upon their having the opportunity of acclimatising themselves to the service of war. I was very much struck with the careful foresight shown with regard to the provision for women and children. Nobody knows so well as the commanding Officers of Militia, the numbers of women and children belonging to the Militia Service. I was perfectly startled the first time I mustered all the women and children in my brigade when we were about to leave head-quarters for district garrison during the Crimean War. I endeavoured to persuade as many as I could to remain at home with their families, knowing what, under the circumstances, garrison life must be for them. The difficulty has to be met as best it may, and it should be met both in regard to militia regiments moved from point to point, and in regard to the regular service in the same way. At any rate I can answer for this, that when the time comes, there will be one voice at least which will place before the Government the suggestions that have been made by our lecturer.

Major WETHERHED, Paymaster, R.A.: I must apologise for trespassing upon the meeting as a non-combatant, but in times like these every Englishman is justified in doing what he can to forward suggestions. I quite agree with what the lecturer said,

but I should like to understand more clearly our plan of defence in the event of threatened invasion. It appears to be generally admitted that there are vulnerable points on our shores upon which an enemy could throw a large force if he had freedom in the Channel from the attack of our fleet. The idea, if I am rightly informed, is not so much to defend those vulnerable points as to collect our forces within certain lines converging on these points, where they might meet an enemy that had effected a landing. This is a vital and important matter, and I consider that all our energy should be taxed to prevent the possibility of hostile forces disembarking on our shores. If there are vulnerable points upon our coast, surely we might have some means not of merely concentrating a large force of Volunteers or Reserves, because the concentration of troops takes a considerable time. We see the difficulty that there is on Easter Monday in conveying a few thousand Volunteers to a particular point on the coast. There is also this danger to be considered, the enemy might make a feint to land at one particular spot, and as we were collecting our forces by the lines of rail converging at that point, the enemy might run for another part of our coast to which our assembled forces could not be transferred by railway without passing through the small and dangerous artery of the Metropolis; but surely we might take greater advantage of the facilities which our insular position and railway system might afford for concentrating on those given points an overwhelming force of artillery. I won't say very heavy guns, but large long-range guns capable of being fought on the railway metals, which might be brought to bear upon any disembarking troops so as to prevent the near approach of the enemy's ships, and check the landing of the force while our Volunteers and Reserves were concentrating. There are many other points which may be considered in connection with this subject. If possible, in case of threatened invasion, I should like to see our fleet blockading all the enemy's ports, and under certain combinations, our whole telegraph system would be interrupted, and it is a matter worth considering how we are best to keep up communication with our fleet in case of war. At present I know of no provision, and I should like one simple experiment to be tried. Our ships which are at a distance would have no means of communicating with our shores except by sending fast steamers between our coast and the fleet; but I would suggest whether it would not be practicable to have the means of sending out from certain points of our coast, steamers fitted with telegraphic apparatus which could run out their telegraph wires and anchor some thirty or forty miles or upwards from the coast, so that when our ships wished to communicate with home, all they would have to do would be for one of their fast cruizers to run for one of these floating telegraph vessels, which would place them in instant communication with the shore and give rapid information as to what was going on on the enemy's coast. That would save our cruizers having constantly to run into port in order to convey information and receive instructions. As I observe that gentlemen of the press are present, I would try to enlist them as Reserve men: I mean in this way. No doubt it is very interesting to Englishmen to know exactly the details of everything that is going on, and it is very desirable that the British public should be well informed as to all those details; but I think we have arrived at a crisis in our country's history when it would be well if Englishmen generally would consider rather our national interests than their own natural curiosity. It is time for the press to maintain a cautious reserve, because what is communicated to our countrymen is communicated very rapidly, perhaps, to that very country with which in a very short time we may find ourselves at war. Therefore, the imformation given to our enemies, as well as our friends, should be limited. I think also that the time has arrived when our arsenals and dockyards should be closed more than they are at present. We do not know who the persons are who go into them to inspect them, therefore it is desirable that we should be cautious and use some reservation with regard to permitting foreigners to visit them. As war seems to be approaching, that we should look among our employés and see that we have no traitors among us who might be the means of communicating information to the enemy.

Lieutenant-Colonel EVELYN, 3rd Royal Surrey Militia: I think it is very useful, in discussing matters of this kind, not to forget the distinction between Auxiliary Forces and Reserve Forces. The Reserve Forces are the First and Second Army Reserve and the Militia Reserve, but not the Militia.

The CHAIRMAN: Colonel Fletcher explained that in his paper.

Colonel EVELYN: I think the whole of the Auxiliary Forces should certainly be put in proper order at this crisis. We are not in danger, as the gallant gentleman who last spoke seems to imagine, of invasion. I doubt if the Russians have any idea of invading us, but they will prove a stout enemy if we attack them, and I am afraid some changes we have lately made, certainly in the portion of the Auxiliary Forces to which I belong, the Militia, have not been conducive to the efficiency of the force. Regiments have been, I fear, seriously injured by the reduction of staff, by the deprivation of quarters, and by being concentrated in brigade depôts, instead of being allowed to remain at outposts. One serious objection is the difficulty there would be if the regiments have to be embodied in winter, in quartering them on a town. It is difficult enough to billet one militia battalion in a small town, but it is extremely difficult to billet two, and if the Militia are wanted in the winter, as was the case in 1854 and 1855, it will be necessary to billet them, and it is impossible to billet them when concentrated two or three battalions together in one small place, because it happens to be the head-quarters of the brigade depôt. Various Acts under which militiamen have served have generally been misunderstood. There seems to be an impression, rather general, that an Act of Parliament can impose any duties on the militiamen, whether they have been undertaken by his engagement or not. For instance, it was said the other day that an Act of Parliament might be passed immediately, making the Militia available for foreign service; but it seems to be forgotten that no Act of Parliament can, or at least ought not to, affect obligations already taken. An Act of Parliament, to make the Militia available for foreign service during war, ought to be passed, but still it would not affect men already enlisted, at least, if it did, they would no longer be volunteers—they would be pressed men. It was tried in 1855; the Militia were then serving under an Act which only bound them to be embodied in case of actual danger of invasion. They were wanted to replace the troops that had gone to the Crimea, and an Act was passed empowering the Government to embody them; they were embodied, and all over England there was much discontent in the Militia, and Government had to reconsider their measures. I hope that no such mistake may be made now. If the Militia are wanted for foreign service, there will be plenty of regiments ready to volunteer; but no service must be forced on the men, or there will be great discontentment and difficulty. I hope it will be remembered that, if the Militia are to take the place of the line, and are to be a skeleton force in time of peace, always to be depended on to march almost at a day's notice, that the staff of those regiments must be kept complete. There must be no such thing as the adjutancy being taken in turns by the Captain of a regular regiment—that there should be no Militia Adjutant, but an Officer of a regular regiment acting as Adjutant. The choice of an Adjutant for a Militia regiment should not be restricted to the ten Captains of the linked line battalion, of whom the two or three seniors are too near their promotion to hold a five years' appointment. The best of the other Captains do not wish to leave their own companies, and probably the only one who can be induced to accept a militia adjutancy is one who wants to marry, or avoid foreign service, or for some similar reason. That is an arrangement that does not work at all. There are some other things that were to be carried out as proposed by the Militia Committee, such as these; that a militia regiment should even be deprived of its sergeant-major, of its quartermaster sergeant, of its orderly-room clerk, of its paymaster's clerk, in fact, of every single thing that makes a battalion a battalion. Each regiment of Militia was to be made a mere unorganized band of recruits, and to be teased into joining the regular Army as quickly as possible. That would be very much like killing the goose that has the golden eggs. If you want an unfailing stream of recruits from the Militia, you must keep up the militia regiments, and not destroy them, and the staff should be always complete, and lodged in good barracks, under the constant supervision of the Adjutant. Under present circumstances, no better plan could be adopted than that of giving up some of the numerous brigade depôt establishments to the militia battalions.

The Volunteers are a most admirable force, and, for my own part, I have spared myself neither trouble or expense in trying to promote their efficiency. Still, we must remember that in the time of the Peninsular war the Volunteers

fell a great deal into disuse after the establishment of the local militia—a force of which one never hears now, and a force which probably many gentlemen in the room never heard of. It was a force organized in the different parishes and drilled on the village greens, and formed a few times in the course of the year into a battalion. It was found, in many respects, a more convenient force than the Volunteers, though the Volunteers had their place and were most admirable in many respects. But what on earth can induce those young gentlemen in the Volunteers to wish, under present circumstances, to serve abroad as private soldiers I cannot quite understand! However, if they like it well and good, but I am afraid, if they have to work with the pay and allowances of private soldiers, and no others, they would not like it very much. If they expect double and treble pay and pensions when they got home, &c., they will be very expensive, and perhaps hardly worth their money. There is one thing I think would add enormously to the efficiency of the Militia. The system of deferred pay has done a great deal of good in the Army, though some of the provisions under which it has been introduced are not, in my opinion, very judicious. I have some right to speak on the subject of deferred pay, for I believe, if it had not been for a letter of mine that appeared in the *Times*, in October, 1873, the term "deferred pay" would not have been applied to this day, with reference to the pay of the soldier, and I was somewhat amused, a year or two after my letter appeared in the *Times*, to see a long discussion, whether Captain Trench or Archdeacon Wright, or somebody else, was the first to make the suggestion. However, I held my peace. I think a modification of deferred pay might be introduced into the Militia, and would stop desertion to a very great extent, as the men get no pay, except when up for training, it would necessarily be a deferred bounty. I quite agree that, in time of war, a system of ballot for the Militia should be re-introduced. But if it is, I do think a man who is balloted for and serves in the Militia five or six years, ought not to be turned adrift, without a farthing in his pocket, at the end of that time; and if the country gave every man who did good service during his period in the Militia, a 5*l.* note, it would not be a bit too much for him to go back to his friends with, and it would make the militia service far more popular than it is, and would prevent the great militia riots which occurred in the late war in consequence of the Ballot Act being put in force. That Ballot Act was carried out with great difficulty, and was attended by several great riots. It was found very difficult to carry out a measure of that sort in England, and doubtless nowadays the difficulty would be increased.

Major WETHERED: I should just like to explain that in what I stated I did not for a moment intend to express the belief that Russia would invade England.

General Sir WILLIAM CODRINGTON: I do not know whether the lecturer referred to the conscription as a necessary part of the Reserve, or any part of the system of England, but Lord Waveney did so refer to it, and possibly it might go forward that it was the feeling of a great number of Officers, that it is necessary to have conscription in England. Now, as everyone is entitled to his opinion, I must own my opinion is decidedly against it, except in case of necessity balloting for Militia for home defence. Conscription for general Army service is contrary to the feeling of England. Not only is it contrary to the feeling of England as a matter of oppression, but it is an extreme oppression in France, in Prussia, and in Russia, where there can be no question about it, and as such, it is contrary to the usual habits and spirit of liberty and feeling in England. On the other hand, I do not believe that there is any more expensive system than this one of conscription. Cheap to the Government, but not nominally cheap for general national interests, or for the lives of the men exposed to it; because I believe there is very little doubt that the hospital and other arrangements in a conscription-country in war have not the same attention paid to them as in England, where the Army is a volunteer army. One main point, however, is that it is a very expensive system nationally. You take away from all classes of society the best members for national improvement, its able-bodied and those of full age; and you force them into the Service not only in war but in peace. They are taken and not able to carry on their own business, or to marry for so many years; I think it is ten, and this in the very prime of a man's life. Therefore I hope it will not be considered as a necessity for England that conscription should take place for the Army.

Lord WAVENEY: I hope I guarded myself in what I said; in fact, I am quite sure I did so guard myself in the first part of my observations. It is this: to the *principle* of conscription we must come; I believe we must come to the principle of general obligation for service, and I think I guarded myself by saying, whether it be by the old form of the ballot, which in its original form takes every man, or by some other manifestation of the principle that no man is to be held exempt from the ballot for home defence, I should wish it to be felt that there is always an obligation to serve for home defence.

Colonel ALCOCK: I am perfectly convinced that the great strength and power of this country arises from the system of voluntary service, and that the actual weakness of foreign countries, although it may appear to be otherwise, arises from obligatory services, and the reason is very obvious. It is this, that the tyranny of the obligatory service is so great that the time will ultimately arrive when the people will resist it, and it must be felt at this moment in Russia; in fact, we are told by the public prints, that in that country unfortunate men are seized in their homes and marched off immediately to the war without having an opportunity of taking leave of their friends. The conclusion I come to with reference to the discontent so caused, is one in which I am supported by, I believe I may say, a great philosopher; for it was the opinion of Auguste Comte many years ago, when he said that the people would ultimately rebel against the tyranny of compulsory service. There is in continental countries another source of weakness connected with this which does not affect us, and the freedom from which among ourselves, must add enormously to the stability and power of England, and that is the effect of the secret societies. It is perfectly well known that there is a mine of socialistic dynamite under many kingdoms, and especially under Russia, and that mine is ready at any moment to explode. I will say no more upon this subject, but still I adhere to my opinion.[1]

Lieutenant G. H. HOSTE, Civil Service Rifles: A gallant Officer, who spoke on the opposite side of the theatre (Colonel Evelyn) drew attention to that part of the lecture which dealt with the question of the employment of Volunteers on foreign service. As is probably known to most of this assembly, this question has been recently much ventilated, and the most opposite views are expressed about it. For my own part, speaking not for a class but as an individual Volunteer, I must say that I cordially agree with the arguments advanced and the conclusions arrived at by Colonel Fletcher. It was said by Colonel Evelyn that Volunteers serving abroad in time of war would not care for the life. Now, Sir, I do not suppose that anybody goes to war with the idea of enjoying himself, but rather with that of doing his duty; and I am convinced that, in the discharge even of the arduous duties of active service, Volunteers would not shrink from encountering the hardships. Equally do I hope that there are many who, in such an emergency as has been described, would be willing to sit very loosely to their civil professions, or even to give up those professions and their prospects altogether, and who would gladly enrol themselves in a special brigade or division for service abroad. I do think that the Volunteer Force ought to consider itself greatly indebted to Colonel Fletcher for having drawn out a definite scheme by which the opportunity of serving abroad is promised to it, and I trust that, if the need arises, that opportunity will be accorded.

Lieut.-Colonel BUSHBY, Rifle Volunteers: The gentleman who has just spoken has partly taken out of my mouth what I was going to say. I wanted to give a practical result to your lecture. I do so with great diffidence, because two letters have appeared from Lord Elcho and the Honourable Charles Lindsay speaking against Volunteers being employed for foreign service. If war should unhappily break out, the services of

[1] As political subjects are not allowed in the discussions at this Institution I thought myself called upon to stop, but I believe that without infringement of the rules, and after having alluded to the reaction in other countries against aggressive wars, in which the assailant trusts to the power of compulsory service for success, I might have added that, when the great amount of physical force which is produced by that means is compared with the smaller figures shown by the voluntary system, we must likewise compare the want or the amount of inherent moral force which each of these systems will respectively promote.—T. S. L. A.

every man that can come forward will be required. I think it would then be a very excellent thing if the Government opened a small office somewhere in the neighbourhood of Charing Cross to take the names of men who would volunteer for foreign service. I will confidently assert that out of the 190,000 you would very soon get up a brigade of say 3,000 men for active service abroad, who might be officered in a very short time, and might be fed from that very Volunteer Force which we keep in England as a Reserve. There are thousands and thousands of young men who pay no taxes to the State, living with their families, doing nothing, who might very well go forward and show that the middle class would be just as ready as the upper and the lower classes to face danger and death. I think such a body of men might be a beginning, and might be fed from the Volunteer Force. At all events, I am quite sure if war were forced upon this country you might get from that body a small beginning, say 3,000 drilled men, from whom under an Officer such as I see before me, you would get, not only good, but desperate service.

Mr. LOWE (Queen's Westminsters) here made some remarks regarding taking the colours into action, and regarding the colour of the *fighting* dress of the Army, but not being *à propos* of the subject of the lecture they are not given.

Colonel FLETCHER: There are very few points that I have to answer. With regard to what Major Wetherhed said, my lecture was upon the Land Reserve Forces, not the Naval Reserve Force. I think the Naval Reserve Force would afford a most excellent topic for a lecture. I agree with Sir William Codrington that the great thing is to avoid a ballot if we possibly can, and all that I hinted at was a ballot for the Militia for home defence, which I thought we might be obliged to have recourse to. The object of my lecture was to show how universal conscription, if it is to be avoided, is only to be avoided by extending the channels of volunteering and increasing the means by which an army may be raised. I must thank Mr. Hoste and Colonel Bushby very much for their remarks with regard to the Volunteer Force, which are very valuable as coming from Officers who have had so very much experience of that force. I am very glad to find that my opinions coincide with theirs.

The CHAIRMAN: I think I may venture in one word to take the sense of this meeting with regard to the valuable paper which has been read, and to thank our friend Colonel Fletcher for it. I say our friend because he is alike the friend of the Army and of the Auxiliary Forces. Several burning questions have been discussed, and foremost is that of conscription. I must say I am inclined as an Englishman to depend more upon the spirit of the people for keeping up the sinews of war. But in an emergency the ballot may be resorted to for keeping up the Militia, and if we have to do that it would not be at variance with our English institutions; it is not long ago indeed since the ballot was thus employed. That, however, would only be a very partial operation, and very different from a general conscription, which would greatly injure commercial interests. Allusion was made by our gallant friend, in the early part of his lecture, to the possibility of employing our Indian troops, and I think that is a very important question for us to consider. I have heard it said more than once in this country, that if we have war with Russia we might reckon upon India to furnish a contingent of native troops. Now, I have served several times in India, and lately commanded a division there, and I am bound to say that in such a war I would go into action with the greatest confidence at the head of sepoy troops, especially the Sikhs and Gourkas. But there is one point that must be rectified before they can be brought to Europe to join in a Russian War, and that is in the tactical organization of the regiments. The European Officers are too few. They are well trained, well educated, excellent Officers, but they are too few, and the tactical duties assigned to them are altogether faulty. There are only seven Officers to a regiment of infantry, and they are all mounted. At my first inspection of a regiment, I asked their tactical positions or distribution in field movements. They knew of none, except to supervise. When the regiment marched past, six Officers followed the last company, having no tactical command whatever. The companies are commanded by natives very well on parade, but they are incapable of tactical knowledge.

Upon one occasion, at a field day, I purposely drove a brigade through exceedingly rough ground, but such as infantry might have to work through in action, and there was not a single European Officer to be seen with one of the regiments; being on horse-

back, they were all choked off behind. Therefore, although doubtless it would be a great thing to employ native troops in a European war, still it must be under very different tactical arrangements to those adopted at present. With regard to our Volunteers joining the Army, which was another of the subjects discussed, there exists much difference of opinion; our military system is composed of very many branches serving under the provisions of their respective Acts, the regular Army, the Militia, and the Volunteers. Then there are two subsidiary Acts which provide the Army and Militia Reserves. Now four of these admit of service abroad; but the Volunteer Act keeps the Volunteer at home; he is enrolled under the Act of 1863, for the purposes of home defence. Nevertheless, it is only natural that Volunteers should with the whole country be imbued with a desire to maintain the honour of England abroad as well as its defence at home. The only question is—how this can best be accomplished. It has been proposed to organize battalions, or even brigades of those Volunteers, who desired to serve abroad; and I dare say that Her Majesty would be very glad on an emergency to authorize such battalions or brigades of Volunteers under selected Officers, to be enrolled for that purpose, but then they would belong to the Army; they would not be any longer Volunteers under the Act of 1863. Speaking as an Army Officer, I would welcome in the field men who are become almost seasoned soldiers by this time. But as a Volunteer Officer I should say, "God speed you as Volunteers to the Army, but no longer Volunteers "under the Act." My gallant friend mentioned also the advisability of having camp instruction in the event of war, and I entirely agree with him; it would indeed be absolutely necessary. But instead of selecting the sites of those camps of instruction in strategical localities, I would be inclined to have them rather nearer their homes, and within easy reach of railways, in fact near railway centres; so that the men should be able to follow to a certain extent their own pursuits, and at the same time receive instruction in large bodies to fit them for their duties in the field. I have nothing more with which to detain you, but request that you will join with me in thanking Colonel Fletcher for his very able paper.

Evening Meeting.

Monday, April 1st, 1878.

Admiral A. P. RYDER in the Chair.

EXPERIENCES OF A NEW SYSTEM OF LIGHTING HER MAJESTY'S SHIPS.

By Cyprian A. G. Bridge, Captain R.N.

It has been suggested to me that an account of my experience of the new system of lighting ships of war, introduced as far as I am aware only on board some of the large-sized ironclads, might be to some extent interesting to the members of this Institution, and possibly even of advantage to Her Majesty's Service. At first it is fitting that what that experience is, should be stated. I filled the post of Commander in an armoured ship, H.M.S. "Audacious," carrying the flag of the Vice-Admiral Commanding-in-Chief on the China Station, for rather more than two years and a half. No person on board was likely to have been more practically interested than myself in the manner in which the ship was lighted. The peculiar duties of an Officer, second in command, naturally make the amount and distribution of light between the decks of the ships to which he belongs, of extreme importance to him. No officer who has held such a post will, it may be confidently asserted, deny that cleanliness, order, and discipline are enormously facilitated by the fact that a ship's decks below are well lighted up. Whatever the class of ship may be, this will be true of her; but in an armoured iron ship divided into many compartments, with few scuttles on the lowest decks, and even fewer arrangements for admitting light to them from above, its truth is even more obvious. Having been second in command of two other armoured vessels, one of wood with flush decks, and one of iron with decks divided by many water-tight bulkheads, and both lighted on the old, or prevailing system, I was able to compare some years' experience of the one with a nearly equal time of the other.

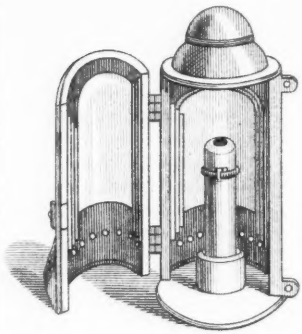
Under the old system, the arrangements for lighting a ship practi-

cally lie in the hands of the Commander, or First Lieutenant. The manner in which it used to be carried out very frequently, suggested to a friend of mine— a second in command of much experience—this forcible and succinct description of it, "It resolved itself into the "Commander's saying, 'Hang it! bring another light here.'" This meant, as will be at once seen, that there was no real system or plan upon which the distribution of illuminating power was arranged. When a corner seemed exceptionally dark, its obscurity was dispelled by the simple expedient of putting in it an extra lantern. The number of lanterns that thus got fixed about a ship by the time she was considered to be properly lighted was often very large; and still some corners continued hidden in the blackest darkness, as lanterns giving "all-round" light were scarcely known in our service. You may imagine how much the illuminating arrangements differed in the same ship during different commissions.

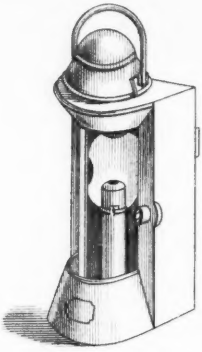
Under the new system, the various lanterns are put up in places decided upon by officers whose special duty it is to discover the best situations for them before the ship goes to sea. In fact, the candle-lighting is just as much a matter of equipment, as the admission of daylight by ports, scuttles, and sky-lights. Illumination follows certain natural laws, and these persons observe them in deciding upon the positions in which to place a lantern. It is not necessary to give an account of these laws here; but it may be stated that two lights properly placed will illuminate, say a quadrangular compartment or "flat," more effectually and, in parts, even more brilliantly, than four placed in ignorance of the laws alluded to. Having had in former ships to devote a good deal of time,—upon which there were already but too many calls,—to discovering the best situation in which to place lanterns for lighting the decks, I am fully sensible of the advantage of having, in the case of the "Audacious," had this done for me.

The lanterns supplied to that ship were—the Deck (for fixing overhead); the Wing (for putting against the side); the Bulkhead (for lighting on both sides of a partition); the Hand (for use of Petty officers, &c.).

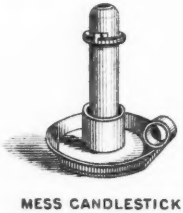
The candle burned in each of the above was of the same size, and was inserted in a tube with a spring and screw cap. The flame was thus always kept in exactly the same position, and the rays, up to the minute even of burning out, fell upon the place to be illuminated always at the same angle. The mess-candlesticks were fitted in a similar manner, and there was, in consequence, no need to shift them as the period of burning drew towards its close. The lamp-trimmers' work thus could be carried on with much greater regularity, and it was known to within a few minutes when it was proper to go round and replace the candles. At night, instead of handfuls of candles put loosely in a candle-box (which by the way had to be made on board), or of several little 24's being inserted in each Petty officer's lantern, where they but too often melted and ran together, some neat tin-trays, supplied fitted from the Government stores, with rows of holes in which were tubes containing candles



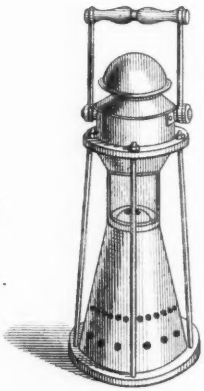
BULKHEAD LANTERN.



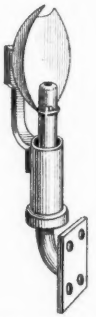
WING LANTERN.



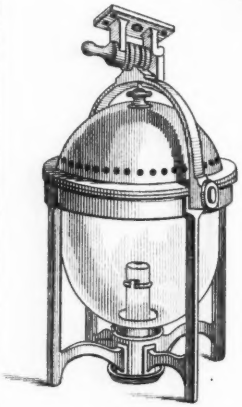
MESS CANDLESTICK.



HAND LANTERN.

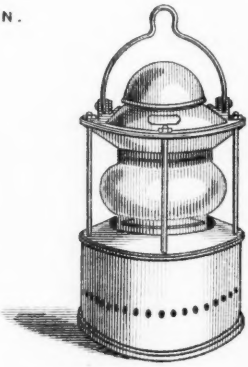


MAGAZINE LIGHT.



DECK LIGHT.

TUBE.



SIGNAL LIGHT.

Harrison & Sons, Lith. St. Martins Lane, W.C.

put into them by the lamp-trimmer, were placed under the sentry's charge, so that the lamps could be replenished during the night-watches by the corporals going their rounds. The reduced liability to dirt and irregularity due to this was marked.

The space beneath the top-gallant forecastle, the heads, urinals, and round-houses, had each a permanent light. The extreme convenience and comfort of this will be understood by anyone who has had to send a corporal of the watch to dig out a missing hand on turn for the look-out, or wait on a breezy maindeck whilst a sentry was lighting a hand-lantern for him, which when obtained would give probably but a respectable glimmer. In the upper battery there were five deck-lanterns fixed overhead; men belonging to the night-watches who cared to read or sew had not, as was often the case under the old plan, to make interest with a captain of a part-of-the-ship for the use of his somewhat dim lantern round which a few would crowd to work. There was light enough for a considerable number, and positions of comfort, on combings, &c., could be selected. In fact the use of the Petty officers' lanterns was to a great extent discontinued, as there was little occasion to take them about the decks, already sufficiently illuminated, to look for anything or any person. Thus the fact that the hand-lanterns, the weakest part of the new system, proved very soon unfit for use did not occasion much inconvenience.

The main battery and half-deck were exclusively lighted—after a few month's trial of a mixed arrangement—by the overhead deck-lanterns. Owing to the flagship being occasionally crowded with supernumeraries, the hammocks were at times obliged to be hung close together; but at no time was there ever the slightest difficulty in seeing the whole deck space between the guns at night, a thing which no arrangement of the old-pattern lamps would have rendered possible. The same advantage was even more fully experienced in the compartments, or "flats," of the lowest deck. Wherever overhead-lighting was adopted—as it was, either by itself or combined with other lamps, in every flat—at night it was possible to see every seam in the deck. Even behind chests, and in the passages between bag-racks, I frequently tried to see if I could read the numbers painted on the lower tier of bags, and was always able to do so with ease. The superiority of the overhead light over the light fixed against the ship's side was well exemplified in the tiller flat. There, one overhead candle illumined the whole deck, whilst two wing-lights of exactly the same power merely lighted up a limited range in front of the reflectors. Nevertheless, the latter were the more striking in appearance to those who prefer seeing a brilliant light to having it usefully cast upon places which, without it, would be in darkness.

The objection to the overhead plan of fixing lanterns is that they interfere with the comfort of men in their hammocks. This certainly deserves consideration; but our experience was that anyone—for by no means every person does—who found himself incommoded by it, in general succeeded in rigging up some sort of screen (a towel on his lashing was a common mode), which hid the light from his own eyes and did not interfere with its general distribution. Men, especially

those confined to their hammocks by illness, were frequently able to read in them—a practice which must have been a comfort to many, and which no attempt was made to discourage. As a rule the lanterns were absolutely smokeless. White-washed beams and painted bulk-heads did not suffer at all, or at the worst but very slightly, from that pest of all other lanterns yet in use in the Service—smoke. In ships in which so large a number of lanterns has to be kept continuously alight, as in the heavy ironclads, this is a great thing.

A lantern constructed to give light when placed high up, as in the new-pattern deck-lantern, has many advantages over those only capable of being fixed low down or of standing on the deck. In general, the whole space of the overhead-deck is available, particularly in iron ships, where the beams usually are so shallow. The proper illuminating point at which to put the source of light—a spot which the natural laws spoken of before discover for us—can generally be made available. When we have to fix a light against the side, we are naturally confined to the four sides of a flat for a position. We cannot get one near the centre. This often compels us to make two lamps do the duty which, if properly placed, might easily be done by one. Low elevations, such as hatchway combings, magazine handing-room scuttles, Downton's pumps, &c., interfere with the rays of a light placed near the deck, and oblige us to select situations for it clear of their obstruction. The field of choice is of course limited in other ways. For example, in a bag flat, where there is a lane between the racks, an overhead lantern can be so put up that it will illumine the lane and the midship part of the flat as well. In the "Audacious," on the port side, the bag-rack extended the whole length of the flat against the side. Further amid-ships was the Marines' rack, in which there were bags about four or five tiers deep. Above the top bag was a space which permitted the light to shine down into the lane and at the same time to illumine the gangway between the doors of the flat. At night, even in the lane, there was no part of the deck upon which a shilling might not have been seen. Now had we used lamps obliged to be fastened low down, as the police lamps and wing lamps of the Service pattern, it would have been necessary to have arranged a special system of lighting for the lanes, and another for the gangways between the water-tight doors. As it was, the flat, even when lighted up for "Quarters," had only six overhead lights in all; and one special wing-light which took the place of a binnacle and telegraph light near the fighting wheel. It will at once be seen that space over such things as drinking tanks, fire tanks, chests, lockers, main-deck bitts, &c., can be easily made use of to fix suspended lights on; whereas, naturally, they could not be placed where these things are lower down. So, too, when the space between decks is high, a lamp can be placed directly in the gangway, if above our heads, without in any way interfering with traffic. Thus an excellent illuminating position is obtained. The lamps themselves are much out of the way whilst up between the beams, and can always be kept *in situ* with convenience, thus preventing a crowded lamp-room. The white-plated overhead lights in use in the "Audacious" were easily cleaned, and were, in the opinion of many, an ornament to

the decks. The higher the burning light is placed, the less chance is there of the temperature of the air between decks being raised unpleasantly, the heated air being already near the deck above, and consequently closer to its point of escape.

The deck-lamps in the batteries being placed overhead were in the position which experience has shown to be the best for fighting-lanterns. This was another advantage of the new plan: when the bugle sounded for "Night quarters" there were no fighting-lanterns to light and put in place. The gun-decks had as much light as was wanted whilst the guns were being cleared for action. It was found that these lights, when placed *beneath* heavy guns, went out on the latter being fired. Some simple arrangements fitted when the ship was on her station, to a great extent diminished this inconvenience, though it did not altogether remove it. A few experiments made in a Naval dockyard would probably put an end to it altogether. The flat in which the magazines and shell-rooms are situated, being usually that immediately below the central battery in armoured ships, would be more securely lighted for action if stout panes of glass were inserted in the water-tight bulkheads, and, at quarters, the whole illumination of the magazine compartment were—as in an ordinary light-room—placed outside it. This would remain true whatever system of lighting were used in the ship.

With regard to the lighting of the ship's company's messes, it may be said, in general, that a candle of about the same size as that in common use in our houses replaced the tiny taper about the size of one's little finger; that a neat spring tube, exactly like that in use in many officers' cabins, capable of giving a complete all-round light, replaced the tin sconce which could only illuminate half of the circle around it. The tubes fixed in the mess-table enabled the men to read, write, and sew by candle-light, and less trouble was experienced than in any ship in which I have served, in stopping the dangerous and dirty practice of each man sticking a little candle-end (previously filched from a stray lantern), on the lid of his ditty-box in order to work by its light. The "standards," as they were called, in which the tubes were inserted, and which supported a circular reflector working on a pivot, and capable of being turned in a horizontal position to throw the light upon the table, or in a vertical one and so cast it horizontally, were soon left out of use. They offered a tempting step by which to get into a hammock, and being soon highly heated were likely to burn a foot placed on them, besides being easily injured. In the lower mess-deck they were found convenient at inspections as they threw a bright light upon the mess-shelves otherwise left in obscurity. The tube system of lights in each mess contained several elements of comfort and convenience. There was no grease falling about; they were neat and sightly, and could be easily shipped in the candle-sticks supplied and be made portable. Placed in order on the deck at morning inspection, their condition could be readily seen to, and they were easily collected by the lamp-trimmer for cleaning and refilling during his working hours in the lamp-room. The whole candle was usually burned in the tube, and the last inch or two of it

was not useless for lighting purposes by being, as with the old plan, in reality nothing more than an end for insertion in the socket of the sconce.

The hand-lanterns were the least successful of all. They were neat, strong, and easily cleaned, and being put together with screws and nuts instead of solder were capable of being repaired by using parts of other lanterns; they gave an admirable light; but the glass tube surrounding the flame was too small in diameter and quickly cracked if not held perpendicular. Complaints were often made of the danger to the hand of a person carrying them from the heat of the upper portion. But all hand-lanterns when lighted get very hot in the roof, and the new ones were only hotter than the old in the proportion of the excess of their illuminating power—due to the larger candle—over that of the tiny 24 in use in the Service pattern. So many glasses got broken that in practice the use of the hand-lanterns was almost discontinued. The ship was so well lighted with continuously burning lamps in all parts that they were not much missed. I should suggest that a slightly increased number of fixed lights be used, and that with the exception of a few "dark lanterns" for the use of the ship's police, and a special lamp for boat service, hand lanterns be altogether discontinued. The fixed lights could always be placed in holds or tiers, when necessary, during provisioning, &c.; and for getting hammocks down it might be made part of the regular routine, that at the pipe, "Unlace hammock-cloths!" the lamp-trimmer should light two or three fixed lamps to illuminate the nettings until they were clear. In harbour a fixed light at the gangway with a movable shade would advantageously replace the side-boys' lanterns. I was convinced that the "fixed light" plan was capable of greater extension than even it had attained in the "Audacious." I would have done away with all the mess table lights and have increased the number of overhead deck-lanterns on the lower deck, of which only a certain number should be kept burning after the order "Out lights" before the Commander's rounds. It was not easy to see why a large room, as a man-of-war's lower deck really is, should be lighted differently from those in hotels, clubs, or even in private houses, or for the matter of that from a wardroom. Two or three lamps in the latter do all that is required by often nearly twenty officers. The locking arrangement of the bulkhead lights was not sufficiently secure, and the bolt could easily be turned by an ordinary knife.

I have no hesitation whatever in recording my conviction that the "Audacious" was not only the best lighted of Her Majesty's ships of which I have any knowledge, but that she was the only one properly lighted that I have ever seen. In no open part of the ship was there any considerable space which at night was not well illuminated. The lamps were sightly, easily kept clean, remarkably free from danger, and almost absolutely smokeless. They could be kept always in place, and thus the liability to damage due to repeated removal to and from the lamp-room, was minimised. This will be realised by any one who has compared the amount of breakage in the case of a moderator being continually moved from pantry to sideboard, side-

board to table, and back again to pantry, with that in the case of a gasalier always in the same place. There is, no doubt, a less striking appearance presented by the decks of a ship with the new lamps than by those of one with the old. Nothing, all must admit, can be more splendid in this direction than the blaze of the great police-lamps of the Service. They are positively dazzling, and if their chief duty was to throw a brilliant glare upon the feet and ankles of the sentry, over the bags, for instance, nothing could be more perfectly carried out. But behind, and by the side of them there is a region of nearly impenetrable darkness, as there is also behind any object placed in the line of their rays; a man standing in front of one practically puts them out. The new plan is due to the idea that the object to be served by a lamp is not that it may be looked at as a brilliant thing, but that it may illumine dark places. If the curiously-shaped gas lamps hung outside jewellers' windows in so many parts of London were turned with their backs to the houses, the effect in such streets as Oxford Street or the Strand undoubtedly would be very fine; but the wares exposed in the windows would be absolutely hidden in darkness. Go down into a flat of the "Audacious" fresh from the sunlight of the upper deck, and, missing the glare of the police-lamp, the want of light seems striking, but go there at night and you will find light enough for almost anything you can require to be done, though probably not a single candle-flame will catch the eye. The real object of artificial light after all is, except on festivals, to give light and not to be looked at.

Of the signal lanterns I had not much opportunity of judging by comparison with others of the Service pattern. Ours were smaller than the copper ones lately in use, and gave an excellent light. They were at the least as brilliant as any I have seen before, and certainly of more convenient dimensions. Being of the same metal as the other lamps they did not require to be cleaned with oil or brick, a fact which we had frequently occasion to notice when comparing the results of the signal-boys' work upon them and upon the flag and flashing lights, which were copper of the older pattern. A trifling re-arrangement of the bow and swivel at the bottom for the signal halliards would enable them to stand upright on the deck, which they do not do at present.

I have thus tried to give an account of my experience of this plan of lighting Her Majesty's ships, and I have not felt called upon to go beyond that. Suggestions for the extension of the system to other and smaller vessels have frequently occurred to me; but that does not come within the scope of this paper. I hope, however, that a few words in allusion to the important pecuniary saving due to the new plan may not be out of place. A ship of the same design as the "Audacious," lighted on the old plan, burnt on an average about 15,300 lbs. of candles of various numbers a year; the latter vessel, lighted on the new plan, used an average quantity of 10,900 lbs., a saving of nearly 30 per cent. The money value of the saving was, on an average, £159 yearly. That is equivalent to a saving every year of more than one-fourth of the total cost.

Experience convinces me that if the new system were in use in every ship in the Service, all would be better lighted, and the figures I have given, and on which I believe reliance can be placed, show that this could be done at a gain of many thousand pounds to the country. The plan has this obvious merit: it is not some ingenious invention protected by a patent; it is the result of experience of what is wanted afloat, of common sense, and of a of a few important, but distinct natural laws.

The CHAIRMAN: I suppose Captain Bridge in asking me to take the chair this evening did so because, as this experiment was tried in the "Audacious," my flag-ship, he thought I might be able in some small degree perhaps to contribute to the information given to-night. I was fortunate on arriving at Singapore in the "Audacious," in 1875, to meet a sister ship, the "Iron Duke," the flag-ship, leaving the station with her lamps lit on the system then in force, and now in force, and therefore, although we were only three days in company, the opportunity was afforded me of appointing a joint committee of an equal number of officers from both ships to visit both ships, by night and by day, to compare the two systems, and make a report to me as to their opinion on the merits and demerits of the two systems. That report of course was sent home to their Lordships, and making due allowance for the partiality which many of us feel for the systems, whatever they may be, under which we live, and with which we are brought into close contact, that report was decidedly in favour of the new system. Especially was it so on the question of economy. We had been long enough in commission to ascertain what was the consumption. I believe it was diminished afterwards, as the Officers and men became more familiar with it; but the economy was, as you heard just now, very considerable; indeed, it was 30 per cent. And when you consider what that is if extended over the whole of the ships of the Navy, you can easily see what a large economy it would be. I believe I am not wrong in stating the economy amounts to about £10,000 a year, which is a considerable sum in these days. Of course the first cost of this system, as far as the plant goes, is larger than with the old lamps. These new lamps, however, are stronger and better made, but the wear and tear is very much less than with the lamps of the old system, so that after striking off what you would have to strike off for interest on extra outlay, I think you would find you might throw the whole question of first cost, as compared with the first cost on the other system, on one side, and look at the matter simply as regards the annual expense of illuminating material, the saving on which amounts, I am informed, to £10,000 or £12,000 a year. If, therefore, a system has been devised which gives us better light by distributing it widely, which is the real secret of the new system, instead of condensing it in certain directions; if we have got rid almost entirely of smoke; if we have got rid of what was a nuisance on board ship—the facility for pilfering candles; if we have put the light close up to the deck above, where it really is close to the vitiated air, so to speak, and does not contribute to that vitiated air, because, as you can easily understand, the magnificent police lights, which are near the deck, heat the air close to them, and that air ascends to the hammocks, while these lights are put above the men; therefore you save largely on the score of coolness and non-vitiation of the air; if, I say, all these points have been gained, together with cleanliness and economy, then it is to be assumed that the system will very soon become universal. I cannot myself suppose but that it will do so when their Lordships have leisure to turn their attention to this among various other matters, which no doubt are necessarily put aside for a short time. I do not think I need trouble you with any more observations regarding this system of lighting, except just this: that the Royal United Service Institution invites, as you know, all inventors of matters connected with the Army or Navy to come here and read papers and explain their inventions. At first sight, some persons perhaps who are not acquainted intimately with the subject, might suppose that this system of lighting is the work of an inventor, who has sent the lamps here, and who has read a paper on the subject. This is not so. Captain Colomb, who devised the new system of lighting, did so when specially employed by the Admi-

ralty, and appointed for the purpose of investigating the whole question of lighting men-of-war. This system, therefore, is not his invention in the sense I have just been speaking of; it is the result of a very careful, long, and arduous inquiry on his part for their Lordships. I cannot but believe that Captain Colomb's system of lighting men-of-war will be adopted in the Royal Navy, and add another to the valuable contributions he has made to the service of which he is such an ornament. Our thanks are due to Captain Bridge for preparing this paper, which has, I well know, been a labour of love.

LECTURE.

Friday, April 5th, 1878.

GENERAL SIR T. MONTAGUE STEELE, K.C.B., &c., &c., Commanding Aldershot District, in the Chair.

I. THE ARMAMENT AND ORGANIZATION OF CAVALRY AND THEIR INFLUENCE ON ITS TACTICS.

II. SUGGESTIONS FOR OBTAINING CAVALRY RESERVES.

By Major S. BOULDERSON, 17th Lancers.

I WISH it to be understood that this is not a lecture properly so called, but merely a paper, for it seems to me that a lecture implies that the opinions given are those of a person well qualified to teach, in fact of an authority on the matter, and to such a position I do not for a moment presume to aspire: my object is simply to put the subject very shortly and imperfectly before you, and to elicit either now, or at some future time, the opinions of men able to judge, with the view of correcting my own errors, and of doing good to a service of which I am proud to be a member.

With regard to armament and organization, the points upon which I wish to raise discussion and to throw light are as follows:—

1st. Firearms. Whether cavalry throughout should be armed with them, or only partially so in each regiment.

2nd. Whether the difficulty can be got over, or lessened, by the employment of mounted infantry; and if such corps are ever adopted, what is the proper place for them in our military system?

3rd. Respective value of the lance and sword, separately, combined, and with or without firearms.

4th. What is the best armament for British cavalry?

5th. The effects of these different armaments and organizations on cavalry tactics.

Armament.

In January last, Mr. Graves, 20th Hussars, in his paper on "Military "Equipment,"[1] entered into the question of the armament of cavalry, but until I had written my paper, I had no idea of the existence of

[1] See Journal, vol. xvii, No. 94, page 120, *et seq.*

his; it is, however, a subject of such importance, that I think it will bear fuller investigation and discussion than he, amongst other subjects, was able to give it.

Mr. Graves sums up his opinion of the proper armament for our cavalry, in these words. "It is my firm belief, that the front rank of "all regiments should be armed with lance and revolver, and the rear "rank with sabre and carbine."

Now I have quite independently come to a somewhat similar, yet a somewhat different conclusion, the difference consisting in my disagreeing with his proposal for revolvers. Instead of revolvers in the front rank, I would have the sword, as I think the lance cannot be separated from it, and that revolvers are dangerous.

Firearms.

A great many cavalry Officers, no doubt with great reason, argue that it is a mistake to put firearms into the hands of the cavalry, for they will be found at the critical moment handling their firearms instead of charging; but against this it may be said that so long as carbines only are used, our rule never to allow any man to fire mounted partly meets the objection.

If, however, the recommendations of revolvers are carried out, weapons which are very apt to be fired off mounted and possibly on the slightest provocation, the objection remains in full force. An Officer once told me that he has seen men in our cavalry, fire mounted in the ranks, without any orders; and just fancy for a moment a *mêlée* in which lancers used the revolver; how many shots would actually hit the man fired at? Would not bullets be flying in all directions? and if so, would it not be a case of "save me from my friends?" There is also the danger of being cut down if you miss your man, and further still there is an awkwardness about a lancer using a pistol, for he must either sling his lance on his arm, or hold it across the saddle in his bridle hand, either way being dangerous to his comrades, or if he insists on using his pistol, might he not drop the lance altogether? Yet it is generally admitted that firearms are necessary either throughout every regiment, including lancers, as at present in our service, or by partial armament with them in each regiment; or again, by having certain corps, such as mounted rifles, the Russian dragoons, &c., to do the dismounted work.

During the 1870–71 campaign, the German Uhlans were obliged to arm themselves with chassepôts to protect themselves against the Franc tireurs, &c., and I believe the Russian cavalry have met with considerable difficulties in the firearms of the Bashi Bazouks during this last campaign. The pistol has therefore gradually given place to the rifle or carbine, which I think must be accepted as the proper firearm.

Pistols.

Nevertheless, should it be decided at any time to give the front rank of Lancers, or any part of them, pistols again, I would advocate a single-barrelled breech-loader, to be carried on the right side of the

man, the object of the pistol being to protect the man if his horse is killed, and never to be fired mounted, except for the purpose of giving an alarm on outpost duty, &c.

It is an unfortunate circumstance that no pistol, unless enormously heavy, could be made to fire the Martini-Henry ammunition, the recoil being so great that no man's wrist could stand it. Mr. Reilly, the gunmaker, I understand, tried it, and the man's wrist was nearly broken.

The Russians, I am informed, have had many accidents with revolvers in this last war.

Now, if no pistol is carried by the front rank, in fact no firearm, those men could carry half the ammunition for the rear rank. In patrol or vedette duty, one lancer from the front rank, and one rear rank man with carbine, could be detached together. Therefore, for the reasons given, I believe it is better not to put firearms into the hands of the front rank at all, but if you give carbines to the rear rank only, you will have as many as you can use, and in the hands of the best shots, and the most intelligent men.

Again, when formed up in double rank for a charge, no rear rank man behind can well fire off his carbine through the front rank on seeing the enemy, and if he attempts to touch it, would be seen by the serre-files behind him.

Mounted Infantry.

It must be understood that I do not advocate the adoption of mounted infantry in the place of cavalry, for I believe that they make bad cavalry and indifferent infantry. But having war in view, and it being admitted that we may have to furnish three corps d'armée from Great Britain, and that six cavalry regiments per corps are required, I say that they can be raised from the infantry of the line, the militia, and perhaps even from the volunteers, far quicker than cavalry; and for this I have a plan to suggest. I propose, therefore, that if our cavalry force is no larger than at present, and that arrangements are not made to supplement it from India, and that we are suddenly called upon to enter on a great war, we might have three regiments of mounted infantry as divisional cavalry for the third corps; and that is, if used at all, I think their proper place. As this question of place comes under the head of tactics, it will be discussed further on.

Many authorities object strongly to mounted infantry, or rifles, and Schellendorf, in his second volume "On the Duties of the General "Staff," is very decided in his opinion against mounted infantry.

Again, many think very highly of them, judging chiefly from the experiences of the American War, and advocate the use of mounted riflemen as *éclaireurs*, leaving the cavalry proper armed only with the lance and sword, employing them chiefly for shock combat on the field of battle, in fact bottling them up for special occasions, and to act in support of the mounted rifles, which are to be considered as light cavalry, and the ears and eyes of an army; but, in my humble opinion, it would be a mistake to push out mounted infantry (call them rifles or dragoons if you will) to the extreme front, and expect them to per-

form these duties—horsemen, the most highly trained and most self-reliant, are alone capable of playing this *rôle*. The Russians have still dragoons, which have been organized as mounted rifles. These dragoons were armed with long rifle, sword, and bayonet, but lately have been re-armed with the Berdan breech-loading carbine, or short rifle, retaining both sword and bayonet. The armament, however, points to the tactics, and I maintain that the tactics of these troops should be those of infantry, able from their mobility to support artillery, cavalry, or infantry, as may be required.

Now, if it is ever decided that this sort of regiment is required in our Service, I wish to point out a plan for raising a few regiments in from four to six months, without drawing on the cavalry for a man, or a horse. Call for volunteers from the line, the militia, and the volunteers, taking only drilled men, who can shoot, and are of good character; give them infantry Officers who can ride (the main difficulty is non-commissioned officers), and attach them to cavalry regiments, say one squadron to each regiment, to learn their stable duties, and to ride, &c.; I am sure, from my previous experience, if well selected, they will learn this in four months.

To give an example:

In the spring of 1857 (the Mutiny year), Sir Sydney Cotton organized a corps, called the Peshawur Light Horse, composed of 200 Europeans, and 100 natives; half the Officers came from the infantry, and half from the cavalry; the Europeans were English infantry, picked from all the four regiments in his division, viz., the 24th, 27th, 70th, and 87th regiments; the equipment and trained cavalry horses were all ready for them; and in four months they were taught to ride, and were immediately sent a march into the district, and to encamp out some time, thus becoming shortly very efficient as cavalry.

This proves, I think, that infantry soldiers can be taught all that mounted infantry would require in four months. Major Lockwood, 20th Hussars, who belonged to this corps the whole time it was embodied, can bear me out.

Respective Value of the Lance and Sword.

The lance is the best and most deadly weapon, for all shock encounters, in pursuit, or in single combat, which last our annual competition will show (its bad point being in the *mêlée*); its moral effect also is very great, as was shown by the 9th Lancers in the Indian mutiny, where the mutineers used to throw themselves down on the ground, hide their firearms, and then jump up after the cavalry had passed, and fire at them; they used also to cut and wound the Hussars' horses as they passed, who were not able to reach them. The Lancers however, invariably ran their lances through them; and such was the terror inspired by the Delhi spearmen, as they were called, that the enemy used to begin to run when they were miles away. For the Hussars they cared very little. The lance is spoken favourably of by Captain Hozier in the 1866 campaign. If all this is admitted, and is true, you will find that early in a campaign, the moral effect of this weapon will make itself felt by those possessing it, as against those

without it. It follows therefore, that if we are pitted against the Russians, for instance, who have their front ranks all armed with the lance, except the Dragoons, we should be at a disadvantage as regards first encounters, at any rate, and the superiority of our men would have to restore the balance.

I wish to dwell particularly on the moral effect of the weapon, the infantry even having a high respect for it. Napoleon held that the moral is to the physical force as three to one, and no one knew more about that than he did. The Germans also thoroughly believe in it; therefore, if by any means the *morale* of one cavalry can be established ever so little over that of the other, those means should not be neglected.

The question of *morale* decides which cavalry shall have a grasp on the greatest extent of country, and the consequent advantages that ensue to its own side.

Some people argue that, because the French have entirely given up the lance, it is fair to suppose they had good reason; but their reason, in my opinion, is simply because they are not naturally good riders, and it is generally admitted that the lance, to be effective, must be in the hands of a good rider. Now are we not good riders as a nation? and if so, are we to throw away the weapon which is especially suited to our national characteristics?

If anyone doubts our being able to use the lance, let him come to our annual competition, and I am sure he will be convinced.

Then why handicap our men by giving so few of them a weapon that they are quite competent to use?

The proportion of lancer regiments in our own and foreign armies is as follows:—

English—1 to 5.
Austrian—1 to 3.
German—1 to 3.
Russian—All regiments except dragoons.
France—None.

The proportion, therefore, is decidedly against us.

The Sword.

As to the sword, it is an excellent weapon for all purposes, but not equal to the lance in the charge and in certain cases, although I think that the lance cannot possibly do without it; it seems to be a necessary adjunct; in the *mêlée* the lance requires its support (for examples of this, I refer you to Mr. Graves's paper). Why, then, not have the sword in close support to the lance?

I therefore come to the conclusion, that lance in front rank and sword in rear rank is the best arrangement; but now, as I came to the conclusion that firearms should only be carried by the rear rank, I want a second weapon for the front rank, and I think it should be the sword. A lance is liable to stick in the enemy's body, or in that of his horse, and be pulled out of the man's hand, and be broken; it may have done its work, but still the owner is defenceless; and what so good in the *mêlée*, that is probably going on, as a sword to fall back upon?

I prefer the sword to the sabre, as the point is the attack to be insisted on. I look upon a sabre to mean a more curved blade than a sword.

The best Armament for British Cavalry.

To sum up, therefore, I consider the best armament for British cavalry is (provided a majority is so armed), lance and sword in the front rank, sword and carbine in the rear rank. This seems to me to dispose at once of the question of over-armament of lancer regiments, and of the extra weight of the three arms; and the more this plan is examined, the more, I believe, will all difficulties be found to disappear.

The only objection I can foresee is, that it may be said, how are the front rank men, when employed as vedettes, &c., to give an alarm without a firearm? My answer is, never employ a front rank man without his rear rank man, who has a carbine; and out of this a mutual reliance would grow, similar to the much-praised one that used to exist between front and rear rank in the infantry.

It may not be generally known that our lancer regiments are now armed with lance, sword, and Martini-Henry carbine in both ranks, the objection to this being, according to some opinions, that a man is over-armed and over-weighted, and has no easy way of getting rid of his sword and lance, on dismounting to fire.

Last year I had command of my regiment at every brigade or divisional field-day, and during the summer manœuvres, when there was frequent occasion to use the sixteen carbines per squadron, which we then had, and in one squadron we tried a new sword-belt, slung from the right shoulder and passing to the left side, with a frog in which the sword was placed loose, and an extra leather frog hung from the saddle into which the sword was transferred on dismounting; to this sword-belt was also attached the ammunition pouch, with an expense pouch for ten rounds, carried on the girdle. I am sorry to say all the men who tried this belt said it made their shoulders ache, and if ball ammunition had been carried it would have been worse.

Now, if a lighter sword were issued it could be carried on the waist-belt through a frog, and thus be removable. Two ways of getting rid of the lance were tried, one by placing the butt-end in the bucket of the stirrup and strapping the pole to the wallet, when it stands upright, but in woods becomes very inconvenient; the other by the man who leads the dismounted man's horse, slinging his lance on his bridle arm. This last arrangement does well enough at a walk if the horses are not fresh, but I had to give strict orders not to exceed this pace for fear of accidents. Yet I maintain that fresh or not (and on service they would be steady enough), if you were to drop a shell amongst them, the men could not manage them with a lance on each arm, and would run their lances into each other, or into the horses. That is why I argue that a man with a carbine is better without a lance.

Nevertheless, I consider our present armament very good; and if you can excuse the weight of the three arms, and, considering the

small proportion of lancers in our service, we are perhaps best as we are.

Foreign Armaments.

France (see armed strength of) had up to last year her cavalry armed as follows:—

Cuirassiers—sword and revolver.

Dragoons, chasseurs, hussars—sword and carbine on the Gras principle, the latter being slung over the men's backs.

No lancers.

Austria.—I cannot obtain the information, but eleven out of forty-one regiments were lancers up to 1873.

Germany had up to 1876 (see armed strength of) cuirassiers—sword and pistol, with exception of sixteen men in each squadron who have carbines.

Dragoons and hussars—sabre and carbine.

Lancers—lance, sabre, and pistol, with exception of thirty-two men in each squadron who have carbines.

Since then they have been armed throughout with carbines, so that every man has lance, sword, and carbine like ourselves.

On dismounting, the lancer removes his sword and fastens both the lance and the sword to the saddle with his surcingle, placing the butt of the lance in the bucket. This, however, is a long business, both in mounting and dismounting.

Russia.—The armed strength of Russia is a translation from the Austrian edition of 1871, and is of no use now. From private information—not official—I learn that the cavalry throughout, except the dragoons, are armed with lance, sabre, and revolver in the front rank, sabre and carbine in the rear rank.

The Cossacks have usually lance, sword, and gun.

The Effect of these different Armaments and Organizations on Cavalry Tactics.

The more the matter is examined, the more it will be seen that the questions of armament and tactics are intimately connected, and if you tell me how a regiment is armed, I will tell you what its tactics ought to be.

To take a plain case, if you give a mounted man a rifle and a bayonet, he is a mounted infantry soldier; but if you give him a sword and carbine he is at once a hussar. Now suppose one of our lancer regiments before we had firearms engaged with a hussar regiment; the hussars would have had the power of attempting to hold the lancers in front with firearms, while they attacked them, mounted, in flank. Plenty of ground can be found where such tactics could be employed with advantage. The lancers, on their side, must defeat the mounted portion of the hussars, and then threaten the horses of the dismounted men before they can get rid of their fire, which may be delivered from behind a ditch or other obstacle in comparative safety.

Now, if we take the lancers armed with carbines, they can meet the enemy's fire; and I think so highly of the lance, and of our cavalry,

that my belief is that the mounted lancers could afford to form in single rank, thus showing a superior front to the enemy, if of equal numbers, and consequently having the power to attack him in flank and front at the same time.

I think lancers are especially suited to single rank formations, and our rear ranks are still kept too close to bring their lances down to the position of the charge with safety to their front rank men, and actually do charge, with their lances at the "Carry," and so might be cut down by a swordsman before they knew where they were.

Now, as to mounted infantry or rifles in conjunction with cavalry, I have before said I think their place is as divisional cavalry. There they are under the hand of the corps-commander, to be massed or despatched on a raid if required; and if not so used, they are better able than cavalry proper to take care of the flanks of their own divisions and to assist in turning the flanks of the enemy. They can rapidly support any threatened point; they can be pushed to the front at the commencement of an action, to support the corps artillery, often hard pressed, before the infantry comes up; and, finally, during the march into an enemy's country they can keep connection between the cavalry, which is ahead, and the infantry divisions, supporting the former when any serious hindrance occurs to their forward march.

In a letter to the *Times*, published in that paper on 2nd April, Captain M'Calmont, speaking of Mr. Forbes's proposal for a special Reconnaissance Corps, says:—

"Sir Garnet Wolseley's suggestion in the 'Nineteenth Century' to "increase, as I understand it, the numbers of light cavalry by special "corps of mounted infantry is a very different thing. Under a proper "organization their assistance would be valuable, while they would "not supersede the regiments already highly trained for the specific "purpose of 'scouting.'"

This supports my view of the divisional cavalry being mounted infantry.

Suggestions for a Cavalry Reserve.

Discharge by purchase has recently been stopped for a time, but on its being re-opened, I would suggest that a man purchasing such indulgence should be obliged to enter the Reserve.

If this had been done during the five years ending December, 1877, my regiment, the 17th Lancers, would have had 146 men, the 4th Dragoon Guards 160 men, the 5th Dragoon Guards 157 men, of the average service of three years in the ranks belonging to the Reserve; these three regiments are on the foreign service establishment, while on the reduced establishment follow the 2nd Dragoon Guards with 110, 7th Hussars 87, 19th Hussars 69, and 3rd Dragoon Guards 62, all of the average service of three years; and it must be borne in mind that men who purchase their discharge usually come from a higher class in life than the ordinary soldier, and are, therefore, better educated.

Just fancy how comparatively comfortable a regiment would feel, entering on active service, with such a reserve to fall back upon.

Instead of which there is no Reserve at all.

Now, I think it quite possible, that if you offer to take back these men on proper terms you will get some of them.

I propose, therefore, after medical examination, to offer to take back any men who have purchased their discharge within a reasonable time, returning them the money they have paid, with the certain option of joining their own or any other regiment they choose, and of claiming their discharge free at the end of the war; being also allowed at once to count their previous service towards good conduct pay, &c., while serving, and on discharge to be given deferred pay for their previous service, as well as the time of their service during the war.

They will have thus a monetary inducement, both on joining and on discharge. I maintain that it is not dear, but cheap, to pay this price for such men.

They should also be told that if married, their families would receive an allowance during their absence, for these families might not like entering a barrack; and no chance of getting the men ought to be thrown away. To show the endless work entailed on the regimental staff in these days, I may mention that 434 men have passed out of my regiment in the five years named.

When I had nearly finished my paper, my attention was called to a lecture delivered by Colonel Evelyn Wood in this Institution, in March, 1873, on "Mounted Riflemen," and on reading it my hopes of being original fell to the ground; it, however, supports the views I had perfectly independently formed, and points out better than I could, the effect that armament has always had on the tactics of cavalry. I propose, therefore, to read you a few extracts. Colonel Wood states the late Field-Marshal Sir John Burgoyne wrote: "The art of applying "mounted infantry to the greatest advantage is as yet unknown."

Colonel Wood adds: "He goes on to record his opinion that such "troops should not be allowed to grow into cavalry. He thought "it was worthy of consideration whether cavalry should not be divided "into two perfectly distinct services; one of heavy cavalry, to be held "in reserve with an army in the field; and the other to be attached to "divisions, and to partake more of the characteristics of mounted "infantry than of the hussars of the present day."

He also adds: "Before our next war, the following points must be "decided:—

"1stly. Shall a portion of each cavalry regiment, or some regiments, "be converted into mounted riflemen? or

"2ndly. Shall some system be adopted to enable a small number of "light infantry soldiers to move with mounted corps?

"I think all thinking soldiers are agreed so far; it is, therefore, "only necessary to ascertain which plan is the more suitable for the "British nation. I venture to argue that to attempt to make dis-"mounted cavalry soldiers compete on anything like equal terms with "infantry would be as unsatisfactory as it must be expensive."

Speaking of Frederick the Great, he says: "After the battle of "Mollwitz, where his cavalry was thoroughly beaten, he laid down two "rules for its guidance:—

"'1st. Cavalry Officers awaiting an attack will be cashiered;
"'2nd. The attack is to be made without firing, the last 200 yards
"'at a gallop.'

"It was natural that the French cavalry should copy their victors,
"who had abolished all firing, but they appear to have copied without
"comprehending that the duty of a dragoon, properly so called, is
"quite different from that of a cavalry soldier. Under Louis XVI,
"better known for his misfortunes and cruel fate than for his military
"genius, the dragoons were transformed into cavalry."

Colonel Wood adds in another place: "It appears to me that it is
"only those Officers who have led cavalry into action, and have seen
"their demeanour when actually striving for life, who are competent
"to decide whether or not the constant use of firearms does or does
"not injure their dash. Unfortunately there are not many to ask,
"but one of the few, in writing on this subject, thus states his
"opinion: 'Cavalry must be armed with firearms, but if used as
"'infantry, it will very soon lose faith in the sword and lance, and
"'will become quite useless as cavalry. You will never get them to
"'do what they did at Balaklava and Rezonville.' There is a well-
"known story of a British cavalry Colonel, who flung his pistol into a
"pool of water when parading his regiment before going into action—
"a forcible hint to his men to trust to *l'arme blanche*. In August,
"1854, at Beuseo, nearest Bucharest, Major O'Reilly, leading Turkish
"cavalry, being about to charge some Cossacks, rode along his line,
"and found every man with his lance slung, his sabre in the scabbard,
"and his pistol cocked. When he induced them to put by their pistols
"and charge, the Cossacks were so unprepared for this unusual
"manœuvre that of about 600 only half-a-dozen attempted to advance,
"while the others fired their carbines and fled. I argue, if you train
"your cavalry to depend chiefly on firearms, you will not get them to
"charge; and for cavalry, considered as such, Frederick's rules are
"still good.

"General Rosser, one of the most distinguished Confederate leaders
"of mounted soldiers, wrote in 1868, three years after the war:
"'Cavalry was not used on the battle-fields as under Ney and Murat,
"because it was not cavalry.'"

He quotes Colonel Hamley and says: "Until the exact position of
"an enemy is accurately known, the cavalry will be pushed on from 20
"to 50 miles in advance of the Army. To obviate the risks incidental
"to this arrangement mounted infantry must accompany the cavalry.
"In the advance from Sedan on Paris, 4th September, 1870, we find
"Von Moltke recommending the Commanders of the 3rd Army and the
"Army of the Meuse 'to send cavalry far to the front, and support
"'it by horse artillery and infantry in carts.'"

And he concludes his lecture by saying: "It may have occurred to
"some of you, if this idea is feasible, why do not the Government
"carry it out? The conditions of our political life render any extra-
"ordinary action by the Government difficult. Suppose the Com-
"mander-in-Chief and the Secretary of State for War are agreed on
"the advisability of creating in the regular Army some such corps as

"I have suggested. After consulting with his colleagues, the "Minister learns that a band of well-intentioned but misguided "Members of the Legislature will oppose any increase to the Army "Estimates, of whatever nature; so he goes to his military colleagues "and says: 'I quite agree with you about these riflemen, but you "'cannot add sixpence to the estimates; so if you must have this new "'corps, you will have to reduce another regiment."

Lieut.-General Beauchamp Walker, C.B.: It would be a very great pity if so remarkably good a paper as the one we have just heard should pass into the Journal without some cavalry soldier saying something about it. I do not say that I agree in all we have heard from Major Boulderson, but I have seldom heard in this Institution a more suggestive paper, or one containing sounder and less wild ideas. On a great many points it is remarkably good. As regards the question of arming cavalry with firearms, I think that Colonel Wood, in the paper he quoted, seems to have got an entirely wrong idea on the subject. He seems to think because you arm cavalry with a firearm therefore you intend them to use their firearms on the field of battle. None but a madman would think of such a thing. I know the French used to do it. I perfectly remember old Sir Thomas Hawker, Colonel-in-Chief of the 6th Dragoon Guards, telling me that the most successful charge he was ever engaged in, was made by the regiment with which he served in the Peninsula against a French regiment, which moved up in line, halted, gave fire, and knocked over a certain proportion of his regiment, and then, as he said, "We were into them long before they could strap "up their carbines." Therefore, it is manifest that using carbines on a field of battle is nothing short of insanity. The wonder would be how anybody could ever get such an idea that such a use of it could be admitted by a cavalry soldier. I, however, would go very far with him in saying that in the present day, and under the uses to which cavalry is now put, a very large proportion, if not the whole, must be armed with a firearm of long range. I do not suppose that anybody ever held a much stronger prejudice on that subject than I did. When I first began my cavalry career, after having been for eleven years in the infantry (of course knowing nothing about cavalry), I set to work to study the subject; I had to ask those who could give me information, and to read and search for the experience which I had to pick up late in life. I formed the strongest possible opinion against the practice of furnishing cavalry generally with carbines, because I found that the consequence of so arming cavalry (unless it was the most disciplined of cavalry, where every man was as well trained as his Officers) was that they would not cut in—they would rather fire the carbine than cut in with the sword. In 1860 the present Lord Napier of Magdala desired me to inspect a regiment of native cavalry in India raised by my friend Walter Fane, which did good service afterwards. I found this regiment armed throughout with the carbine. I went straight to Sir Robert Napier, and reported extremely well as to the general drill and appearance of the regiment, but I said, "Sir, only think, the Government of India have given all the men carbines. "You may rest assured these fellows will never charge home; they have very few "European Officers, and the end will be, they will stand off as far as possible and "fire their carbines, instead of cutting in with the lance and the sword." Sir Robert Napier, after consulting with other Officers in Calcutta, gave me authority the next morning to disarm that regiment, with the exception of twenty-four carbines per squadron. But the times have changed. In those days we did not attach the same importance to keeping the enemy dark as to our intentions, as we do now. We have gained a good deal of experience during the last two continental wars, which shows that if you intend to do any good you must keep your own intentions dark, and at the same time you must know what your enemy is about. For that purpose it is now the custom to push bodies of cavalry to very great distances in the front or on the flanks of armies moving in the field, so as to form a veil to the army behind them. In the performance of this duty, circumstances frequently arise in which they not only succeed in detecting what the enemy is doing, but if they have a firearm, in the use of which they can employ a portion of their force, they can prevent the enemy re-taking the points which they have seized upon. In fact, they can *hold*

important points of advantage which by their mobility they have gained, and for that purpose the greater part of all cavalry should in the present day be armed with a firearm of sufficiently long range to compete with infantry up to a certain distance; in fact, up to the distance to which most sensible men think infantry fire ought to be confined. In armies where you have a very large force of cavalry, and can afford to be extravagant, you may indulge in such expensive luxuries as cuirassiers and lancers, but in small armies the greater portion (if not the whole) of the cavalry ought to be armed with a carbine. I was not aware until Major Boulderson told us just now in his lecture, that the whole of the Prussian lancers were armed with a carbine, and I am very much surprised to hear it. I gave up my post in Berlin in April of last year, and I really since have failed to follow the course of the armament of the lancer; I can only say what was the case while I was in the country. The question was under discussion for two years, and every possible way of carrying the carbine and lance was tried. The Emperor was extremely opposed to it, so was one of the smartest of their Generals, Field-Marshal Von Manteuffel; but it was agreed that for purposes on which lancers might be employed, as well as other cavalry, it was necessary that they should be able to hold what they got, or to prevent themselves being driven off by small and indifferent bodies of infantry. In the first place they armed them with the French Chassepot cut short. The lancers in the Prussian Army knew so well the value of the possession of a good firearm that they used to collect the Chassepots off the field of battle, substitute them for their own carbines, and carry these long rifles slung across their backs.[1] They tried also carrying the carbine slung over the left shoulder; that was also condemned, and for good reason. I have been for the last six or eight years passing the whole of my few holidays in deer-stalking, and I unhesitatingly condemn the practice of carrying the carbine, or whatever it may be, in that manner; it is a most disagreeable and uncomfortable way, not to speak of the horrible manner in which it spoils your clothes. I found that if I strapped it so tight that it did not knock about when I trotted, it exerted a most painful pressure on the chest. If I slung it loosely, I came home black and blue from the trigger-guard striking on the hip. The Prussians, therefore, returned to the old mode of carrying the carbine, like ourselves, on the right side. Major Boulderson mentioned the difficulty of dismounting. The whole thing was tried at a parade before the Emperor in the spring of 1876. The surcingle was loosened, the lance left in the bucket on the off side, the sword placed against the saddle, hilt to the front, on the near side, in the same way as the Spahis carried their swords, and the surcingle was then buckled over both lance and sword. The horses were taken by the centre men of threes, the rights and lefts dismounting for foot service; but I had no idea until I heard it from Major Boulderson to-day that they had attempted to give the carbine to more than thirty-two men per squadron. No doubt the lance is a most formidable weapon, but the question that arises in my mind is whether, with the extremely small force of cavalry that we have, we can be so extravagant as to have any large force of lancers. I do not think we could sacrifice the whole of the front ranks of our cavalry by giving them the lance; we should have too many lancers in proportion to the number of men who had the carbine. As to mounted infantry, of which we have heard, in my opinion they are neither one thing nor the other; they are not good cavalry, and therefore are unable to undertake independent duties as bodies of cavalry, and they certainly to a great extent would be spoiled as infantry. I do not think, therefore, in a small army like ours that it is a force which is necessary for us to have. You may improvise them, certainly, as the Germans did on certain occasions, by collecting carts and sending infantry in those carts along with the cavalry. In that way they are very useful; but the greater part of the successful expeditions, when great hurt was caused to the enemy by destroying railways, blowing up bridges, getting possession of stores and cutting off convoys, was performed during the war of 1871 solely by cavalry who, being armed with good carbines, and being also good cavalry, accustomed to ride long distances, accustomed to look after their horses, and to know what to do through-

[1] After the war various modes of carrying the carbine were tried. They first carried the carbine perpendicularly on the off side. This was rejected because of inconvenience when going over rough ground.—B. W.

out the whole business, were certainly more efficient than any infantry temporarily detached for the same service could have been. In Germany a most careful system is now carried out by which the non-commissioned officers and a certain number of men in every regiment of cavalry are specially instructed in the use of instruments for destroying railways. I applied to be allowed to see the instructions, but I was distinctly and positively refused by the War Minister. I am much obliged to you for listening to me, but I really felt almost ashamed, knowing the great pains that Major Boulderson has taken, that no cavalry soldier should say a few words in praise of his lecture.

Colonel Lord ELCHO, M.P.: I have waited in hopes that some cavalry Officer would have spoken on what I venture to think is one of the most important questions which could be brought before this Institution, namely, how cavalry are to be armed. As it happens, reference has been made to Colonel Evelyn Wood's lecture; it has been largely quoted from by Major Boulderson, and it happens that I was in the chair on that occasion, the late Sir Hope Grant being present. I gather from Major Boulderson's lecture that he is in favour of arming cavalry in different ways, according to the position of the men in the ranks; that he would arm the front rank with lance, sword, and pistol, and the rear rank with carbine and sword. I was under the impression that everything was tending, both in cavalry and infantry, to the interchangeableness of ranks; that in the infantry, by turning to the "right about," the front rank should become the rear rank, and the rear rank the front rank, and that the same sensible change was going on also in the cavalry. There must be many occasions when it is desirable that a change of front should be made, and I was under the impression that any idea of keeping front and rear rank distinct and arming them differently, as proposed by Major Boulderson, belonged to a time gone by in military tactics. What was the origin of front and rear rank? Simply that as a man tries to show his best teeth, and if he has decayed teeth he would rather not show them, the picked men were put in the front rank and the scrubby men in the rear, and in those days of pipeclay you tried always to keep your best men in front. I, therefore, venture to think I am borne out in stating that the tendency of the age is to get rid of these distinctions of front and rear rank, and that therefore an argument based on the assumption of the continuance of the old system falls to the ground. The question rather is, what the whole of your cavalry should be armed with? As to lance, sword, or pistol, not being a cavalry Officer, and only a civilian soldier, it is not for me to give an opinion, and if I speak at all on military matters I do so on the ground that in military matters ordinary common sense comes into play. After all, soldiers are nothing more than hunters of men, and principles which apply to the ordinary tactics of hunting beasts apply equally to the tactics of hunting men; therefore I say any man who hunts beasts where he has to bring his common sense to bear is justified in giving an opinion on common sense matters with reference to the mode of hunting men. Let us assume that the whole of your cavalry is to be armed with the same weapons; I mean to say that there is no distinction between front and rear rank. I do not say whether it should be armed with lance or sword, or with both; but I certainly think we are greatly indebted to General Walker for giving us the weight of his opinion and experience, not only in the English Army, but with foreign armies, he having occupied the responsible position of military attaché at Berlin, and the result of his experience is, not only that we should give a firearm to every cavalry soldier, but that it should be of the longest possible range, and he sets his face dead against what Colonel Evelyn Wood proposed, viz., the establishment of corps of mounted infantry. It was perhaps rather rude, but no sooner had Colonel Evelyn Wood finished his lecture than a great many of those present fell foul of him, objecting to the view he took, and no one more so than that distinguished cavalry Officer Sir Hope Grant; he was the first to denounce the idea of these corps which Colonel Evelyn Wood was in favour of being considered as foot-soldiers put upon horseback only. I think he said "men taken out of the ranks and taught to ride." Sir Hope Grant's view was as, I think, would be that of most of us, that a force of that description, who are to be the *éclaireurs* of the Army, should be mounted on the best horses and armed with the best weapons. His Royal Highness the President, at the meeting of the National Rifle Association last year, said it was as essential that a cavalry soldier should shoot well as it was that an infantry soldier should do so.

Now shooting well not only means shooting with accuracy at a hundred yards, but that he should shoot as well at long distances as an infantry soldier. And that brings us to the question, assuming that it is desirable that a cavalry soldier should carry a firearm, whether it should be a carbine or a more powerful description of weapon. I think it is a matter of plain common sense, assuming that they are all to have firearms, that if they can, with convenience to man and beast, carry an arm which will shoot as well as the arm which the infantry carry, they will be more effective in the field thus armed than if—because hitherto a carbine has been commonly used by the cavalry soldier—he is still to carry that arm, with which he is powerless when opposed to an infantry soldier beyond a certain range. The Secretary of State for War the other day said the Martini-Henry carbine, which the cavalry have now got, was more accurate at a thousand yards than the Martini-Henry rifle. Now any man who knows anything about shooting knows that this is manifestly impossible. On my way here I went into Mr. Wilkinson's, the gunmaker's, and measured the respective lengths of the Martini-Henry carbine and rifle. One is eleven inches longer than the other, and any man who knows anything about shooting must know that the man who is armed with the carbine which is eleven inches shorter than the rifle, if he is to meet a man armed with that rifle which is a short weapon, must in the long run either be killed or run away. That is absolutely certain as regards the result of the shooting qualities of those two weapons. Therefore, common sense points to dropping the word "carbine," and that if you are to give a firearm to your cavalry soldiers that it should be the best they can conveniently carry. Then comes this question of carrying. The Secretary of State for War also said as a reason for adopting the Martini-Henry carbine that in the recent war either the Russians or the Turks—probably the Russians—were asking for a shorter weapon on account of the inconvenience of the longer one. That entirely depends upon the method of carrying. There was a model cavalry corps, unfortunately now extinct, viz., the Hants Mounted Rifle Volunteers, and on the occasion of Colonel Evelyn Wood's lecture we had here its colonel, Colonel Bower, with the equipment of the corps. He put the saddle on to a block, got on it, showed how the long rifle could be carried with the utmost convenience in the Namaqua bucket; and I can myself speak practically on this point, because I have tried it by going over fences and through spinnies, and from the way the rifle is fixed to the saddle it is no inconvenience to the rider and offers no obstruction to the free use of the sword arm. This is probably the simplest and best possible way of carrying a rifle. It is not an invention of Colonel Bower's. Colonel Bower, when employed by the East India Company at the Cape to buy horses, made acquaintance with the Namaqua bucket, as used by the Kaffirs to carry their guns on horseback, and there can be no doubt that they did so in the way most convenient to themselves. Nothing can be more intolerable, as General Walker has told us, than anybody attempting to attach the gun to himself. I have been a deerstalker all my life, and the one thing one tried to do was to put the weight of the gun on the horse, and not on one's self. That is what is done by the Namaqua bucket in the most convenient manner, and when the cavalry soldier wants to use his rifle, he can get it at once. I happened to succeed Lord Spencer on the Small Arms Committee, the result of which was the selection of a long-range rifle, handy and light, which would do for all branches of the Service. Up to that time there had been one kind of rifle for the infantry, another for rifle regiments, a carbine for the engineers, another for the artillery, besides a rifle for the Navy. We thought as practical men it would be an immense thing for the Service, for economy, supply of ammunition, and other reasons if, instead of having all these various arms, we could decide upon one suitable for all purposes, and this the Committee succeeded in doing. I was, therefore, very sorry when I saw that the intention of the Committee had been departed from, and that we were going to have for the cavalry a carbine instead of the Martini-Henry rifle, which the Committee intended to answer all purposes. In conclusion, I would only say that I know that there are strong advocates in the cavalry for the carbine as against the rifle; that they are afraid of being made mounted infantry. It is not a question of their being mounted infantry, but of making them the most efficient cavalry you can for all the purposes for which cavalry are likely to be used, and I venture to think the long rifle is more useful, taking the whole extent and work of a campaign, than a carbine that will carry much shorter

distances. We are now all armed with breech-loaders. This same question as between the infantry rifle and carbine really is in principle a renewal of the old argument we used to have in this room from time to time upon the question of breech- *versus* muzzle-loaders. I heard His Royal Highness the President, when in the chair at a meeting of our National Rifle Association, and when we were urging the adoption of the breech-loader for the Army, say: "Be very cautious how you "adopt the breech-loader for the Army, because the ammunition will be so rapidly "expended that it will be difficult to keep up the supply." There was no doubt a prejudice against it for those reasons. Sadowa came and swept the whole of that away, and I suppose there is not a man in this kingdom who would wish to take out a regiment armed with muzzle-loaders against a regiment with breech-loaders. At that time when I found any man who was hesitating and anxious to retain the muzzle-loader, I used to put this question to him: "Suppose you are going out "with an army of 20,000 or 50,000 men; you say you are in favour of the muzzle-"loader; you know you are going to be opposed to an army equal to your own in "all other respects, but which will be armed with the breech-loader; which would "you take?" The answer invariably was: "Oh! under those circumstances, I should "choose the breech-loader." I use that as an illustration of this present question as between a long and short range arm for cavalry. If any gentleman is in favour of the carbine for cavalry, instead of the infantry rifle which the Committee recommended, I would put the same question to him. He knows he has cavalry to command, and that he will be opposed by cavalry equal to his own in every respect, as regards horses, as regards the *morale* of the men, equal in number, and armed with a long range rifle. I would ask any man in his sober senses if he had to meet cavalry so armed, would he choose the long rifle or carbine for his own men? There can be but one answer, and I venture with all due respect to say, talking as a civilian, and I hope trying to talk common sense upon a common sense matter, *cadet questio*, when it is put in that way to gentlemen who argue in favour of short range against long range arms. I, therefore, hope that we may see our cavalry carrying rifles, but still essentially cavalry, doing all that cavalry are able to do now, and a good deal more. It would require this, however, that their clothes should be a good deal looser, with trousers not so tight as they now are, because I often see cavalry soldiers so attired that unless their trousers are made of leather or elastic, I do not see how possibly they can get on or off their horses. That is the only other practical change that would be necessary, but I hope that these changes will be brought about; and I trust that Major Boulderson will forgive a civilian for venturing to express opinions which materially differ from those he has expounded. At the same time I would offer my thanks as a member of this Institution to him for having brought this subject before us, for I believe few things more important can be discussed in this room.

Lieut. GRAVES, 20th Hussars: Lord Elcho has differed rather with Major Boulderson as regards the arming of the rear rank differently from the front rank, upon the principle that the rear rank ought to be able to do exactly what the front rank does when we go "fours about;" but I think we move now in the cavalry more by the "wheel "about" of troops than by getting the rear rank in front, and I think with very great advantage. I quite agree with Major Boulderson in saying the rear rank only should be armed with carbines, for the simple reason that scarcely if ever does a regiment use more than one-third of its firearms at any one time. There is another very strong reason why the rear rank only should be armed with the carbine; it is this: when we come to a point which we want to hold, and the order is given, "odd "numbers," or "even numbers with carbines, dismount!" it should not be left to chance whether the odd numbers or even numbers may or may not be the worst shots in the whole squadron; the carbines ought to be in the hands of the best shots, they ought to be picked men, and ought to be drilled and taught that it is upon their carbines that the retention of the point depends more particularly. Their place then ought to be in the rear rank. If the rear rank were armed thus with carbines we should have a sufficient number of carbines continuously all through the whole Service. Speaking of revolvers, the gallant lecturer says: "Just fancy at "the moment of a *mêlée* in which lancers used revolvers, how many shots would "actually hit the men fired at." This is not a matter of theory; the experience of the American War gives us facts upon which we can go, and I hold in my hand one

or two cases which supply a telling answer to the lecturer's question. In November, 1864, a fight took place in Virginia between a squadron of Federal cavalry armed with the sabre, and a squadron of Mosby's armed with the revolver; the loss of the latter was one man killed and several wounded, and the loss of the Federals was 24 men killed, 12 wounded, and 62 prisoners; 36 killed and wounded out of 100. I think that speaks for itself. In a similar fight the sabres lost 26 killed and wounded, 54 prisoners and 80 horses, the Confederates, who were armed with the revolver, lost not a single man. However, the Commander-in-Chief has decided to give revolvers to all the details of regiments of cavalry upon the war strength. I believe that is a step in the right direction which is supported by the facts of war. This revolver carries the Henry-Martini bullet with a 23-grain charge of powder, and is a very useful weapon with the exception of the method of unloading the empty cartridges. It is very cumbersome in that way. On the other hand, I would ask, how many would be killed in a *mêlée* where the sabre or lance is used? In 1799, at Egmont-op-Zee, two troops of English cavalry charged 500 French and drove them off; the French rallied and charged again; however, the result of both *mêlées* was the loss on the English side of 3 killed and 9 wounded. The fact is our sabres do not cut. I forget who it was said that in the charge of the Guards at Waterloo, it was like so many hundred hammers coming down upon as many smiths' anvils; as a proof that our sabres as a rule do not cut. In the whole of the Franco-German war out of 65,000 killed on the German side, only 218 were killed and wounded with the sabre and clubbed musket and lance. The killed by the sabre in the whole six months' war, including Woerth, Vionville, and Sedan, together with the battles on the Loire and the northern provinces, as well as all the outpost service, extending over nearly half of France, was six, notwithstanding that there were 40,000 cavalry engaged. Therefore, if we are going to do any work in the shape of cavalry *versus* cavalry in active service, I think the revolver is the weapon for the front rank, and I also believe it is quite sufficient to arm the rear rank only with carbines. I quite agree with Lord Elcho that it ought to be a weapon of the longest possible range which can be carried. With regard to mounted infantry with rifles, that also is not a question of theory, but of facts. It is not a question what we think they might do, whether they might make bad cavalry and worse infantry, but what they have done when they have been tried. In the American war, General Sheridan had 10,000 of this arm under his command, and, as Sir Garnet Wolseley said, when I read a paper here last January, they were bad cavalry; however, they were able to take up and hold strategical points in such a way as to do great service. The use Sheridan made of them when dealing with General Lee's rear guard on the way to Lynchburg is very striking, but then they were thoroughly instructed in the use of their arms, and they were the means of 6,000 prisoners being taken, together with 16 guns and 400 waggons. He was pursuing and came in contact with the rear guard of his opponent. He engaged them with a small force and sent about 8,000 of his mounted infantry round; they went in rear of the rear guard, cut them off from the main body, and took up a position upon a river under very favourable circumstances, and the result was that the whole lot were taken prisoners or killed. This was done by bad cavalry and only middling infantry. I was told at a brigade depôt the other day that the men coming for enlistment were very small. Those are the men we want for that particular work. Our hussars scale an average of 19 stone each; now I maintain that that is not the weight for an hussar or for mounted rifles, and for that particular arm, mounted infantry. They should be the lightest men obtainable, and I dare say many infantry Colonels would be glad to get rid of twenty good charactered men of small size and light weight. I see from the Chancellor of the Exchequer's statement last night that he has spent 240,000*l.* in horses. Now supposing we have no war, what will be done with those horses? I believe the Government have a very good opportunity of forming three or four or five fresh corps either of cavalry or mounted rifles, and there are many Officers who would be very glad to volunteer for service in them. It would not occasion any very great expense of men to existing battalions, and I believe would be a very great help. I take it, as I look back upon history and mark the failures of great men and great armies through want of cavalry, that that is the point where we shall fail. We have a very small force of cavalry; we cannot afford to turn it into infantry; we want a

force that will do the work of infantry and hold places which we cannot afford to give cavalry to.

I think the Council of this Institution may be congratulated upon obtaining such a valuable addition to their Journal as the lecture to which we have listened.

Note.—It may be well to remark that "mixed armament" for cavalry is supported by such men as Jomini, Marmont, De Brac, and Napoleon, as well as such writers as Hozier, Trower, Dennison, and Elliott, to say nothing of the telling results of modern warfare, and the action of several of the Powers of Europe.

General Sir WM. CODRINGTON, G.C.B.: There is one important point to know with regard to this armament of cavalry, whether they are to be dismounted to use these rifles that Lord Elcho speaks of, or whether they are to use them on their horses.

Lord ELCHO: They never fire mounted.

Sir WM. CODRINGTON: Then I understand that they are to be dismounted and will act as infantry: they must have some one to hold their horses.

Major BOULDERSON: It is only in very exceptional cases. The tactics remain exactly as they were, only that they are supposed to dismount to use their fire-arms on special occasions.

Sir WM. CODRINGTON: Is the man who dismounts to hold his own horse?

Major BOULDERSON: No.

Sir WM. CODRINGTON: Then there would be two-thirds of the horses held by the others.

General BEAUCHAMP WALKER: They dismount two-thirds in the German service.

Sir WM. CODRINGTON: It is essential to know whether the cavalry man is to fire his rifle from his horse, which I understand is entirely given up.

General BEAUCHAMP WALKER: Forbidden on pain of death in our service.

Sir WM. CODRINGTON: Then the horse must be held by another man; that is what I wanted to know.

Major BOULDERSON: There are just one or two small points I wanted to refer to in answer to those gentlemen who have spoken; and first of all, referring to what General Walker has said, I merely quoted Colonel Evelyn Wood's lecture to show it is a matter of history that when cavalry are given firearms they invariably do deteriorate. That was almost my sole object in quoting that lecture, but it also shows that their tactics invariably alter when you alter their armament. Then, as to the mounted infantry, I do not advocate mounted infantry, but something should be done to prevent the cavalry deteriorating, which I maintain will necessarily follow by giving to it these firearms throughout regiments, and forcing it to use those tactics. History proves it so. Therefore, however bad these corps of mounted infantry may be, still they are of some value, and if they are used in their proper place to support the cavalry, they may be made considerable use of. They may be bad in some ways, but still it will save to a very great extent the cavalry from deterioration by being used as infantry.[1] My chief object in proposing mounted infantry was because we cannot supply three army corps with cavalry. We are talking of sending three corps out in case of war, and I say you have not sufficient cavalry for the third corps. I showed you a way in which you could secure a sort of cavalry ready to act with the divisions in at most six months, and in no other way can you obtain the cavalry in that time. That this can be done is proved by the case of the Peshawur Light Horse, which I have quoted in my paper.

The CHAIRMAN: I have very few words to say. It is very evident from the course taken at this meeting that there are a great variety of opinions. Some Officers advocate the use of cavalry exclusively as cavalry; others say that cavalry can be made available for infantry purposes, and others that there should be mounted infantry. First, as to the firearms. I have not the slightest doubt in my own mind that every cavalry soldier should be armed with a firearm. I have long held that the cavalry man with either lance or sword in his hand may be available for a certain kind of service, but as for general service he is useless. I am quite

[1] By arming the rear rank only with firearms, you may keep the old cavalry spirit alive, and at the same time satisfy the modern requirements.—S. B.

convinced of what Lord Elcho says, although the only point I have any doubt about is with reference to using the long rifle, whether it can be so slung on the saddle that it is not an inconvenience to the man mounting and dismounting, because even with the carbine as slung in the bucket now it requires a man to be tolerably active, especially with those very tight trousers which have been mentioned, I can admit it is a very difficult thing to get a man into the saddle, but at the same time if a long rifle can be carried as well as a short one, there is no doubt the long one is infinitely preferable. I do not at all like the idea of having the front rank armed with one weapon and the rear rank armed with another. I think those days are entirely gone by. If you have your front rank armed with one, and your rear rank armed with another, it may do very well, supposing all your men are on parade, but it may happen in war that your front rank men are half killed, or if you want your carbines, and those men are killed, you lose the use of them; whereas if you have them all armed in the same way the squadron leader has only to say, "I want so many "men to go to the front," and those men are available for the purpose whatever weapons they have to use. Of course, my friend Major Boulderson, being a lancer, thinks it high treason for me to oppose him very vehemently, but I have also come to the conclusion, that really in our Army, lancers should be done away with. The lance is a very good weapon, and there may be cases such as those referred to in India where no doubt it is most valuable, and there are a great many cases where the lance is a very formidable weapon. But then we must look at the relative value between the lance and the sword. If I recollect aright there were two instances in the Austro-Prussian war. On one occasion the Austrian lancers were met by the Prussian hussars, and the Prussian hussars rode them down. On another occasion it was *vice versâ*, the Prussians had lancers, met the Austrian's hussars, and the Prussian lancers rode the Austrian hussars down; proving that it is not altogether a matter of weapons but of men.

General WALKER: And place.

The CHAIRMAN: Exactly; so that with our small force of cavalry I cannot help thinking a lancer is an expensive arm for us to have. As it is at present the lancer has to use his lance, he has to be taught the use of his sword, and also the use of his rifle. You are asking a man to attain almost perfection in the use of three weapons, where, as every one knows, it requires a very considerable period of service to make a man able to use his lance, and when he uses his lance he has to be a swordsman, and on other occasions to be a good rifleman. It is asking a man to do more than the great majority of men are able to do, and, therefore, I am almost afraid the lancer would be jack of all trades and master of none. With reference to the mounted infantry there is no question, if we could have them, there are many occasions where they would be very good, but I am not quite certain in my own mind whether, if the money is to be spent and the men to be obtained, it would not be a far greater advantage to our Army to have them as cavalry and not as mounted infantry. I am very doubtful upon that fact. If the money is to be voted I am all for having more cavalry. There are such instances as those that Lieutenant Graves mentioned, in which no doubt they were very valuable, and did great service in the American war; but there is a feature that has come out very strongly in all these last wars, and that is the use of the spade for an army in position, and no doubt when an army takes up a position, entrenches itself, and occupies that position, mounted infantry are not of very much use. Mounted infantry may be useful for a raid, or to charge an enemy's position on different occasions, but in line of battle, where you have 200,000 and 300,000 in the field, a small portion of mounted infantry will be of very little use, more especially where you have entrenchments which no mounted infantry could come anywhere near. Those are all the observations I have to make, and I will, on your behalf, thank Major Boulderson for his interesting lecture.

Lord ELCHO: May I ask General Walker a question? I have heard that the Russians are now armed with lances.

General WALKER: They have been for many years.

The CHAIRMAN: General Walker was aide-de-camp to Lord Lucan in the Crimea; perhaps he can tell us whether at that charge of heavy cavalry, when Sir John Scarlett and our heavy brigade went into that mass of Russians as a hot knife does

into butter, most of the Russian cavalry were armed in regiments or in ranks with lances.

General WALKER: I know they had lancers, because I was employed reconnoitring, and I believe I was the first person who ever counted the Russian cavalry; they had sixteen squadrons armed in a certain way.

Lieutenant GRAVES: What pace were the Russians moving at?

General HODGE: When the heavy cavalry charged in, the Cossacks enveloped the regiments that went in. It so happened my regiment was in reserve, and we came in almost to the rear.

General WALKER: My impression from memory is—it is difficult to answer these questions on the spur of the moment—that the sixteen squadrons of regular cavalry were all hussars, and there were about 500 Cossacks who carried the lance; but I think the regiments of regular Russian cavalry which I saw day after day, and got pretty close to, were all hussars, to the best of my recollection. If it is not too late I should like to make one short remark, in answer to your own very apt illustration of the campaign of 1860, where the Austrians and Prussians came out together. I do not think it matters when you come to heavy men whether they are lancers or swordsmen, because the men who go the greatest pace, and cut in with the greatest determination, will probably ride the others down. I have asked General Hodge's permission to advert to one of the most notorious instances in war where lancers were supposed to have gained the advantage. It was the day when General Hodge's father was killed. The story is supposed always to prove the great superiority which the lancers exercised over hussars; I heard the whole story from an eye-witness. It seems that a body of French lancers debouching from Genappe stuck themselves between two walls. The 7th Hussars charged them twice, and were received on the points of the lances, and spitted like fowls; but I believe our Life Guards rode them down afterwards, when they were foolish enough to come out from between the walls, but not till then. It was not until the lancers came into the open, and gave the Guards the opportunity of charging on equal terms that they were ridden down. While they stuck themselves between the walls and formed themselves into the phalanx they obtained the great success which they did obtain over the 7th Hussars. It was somewhat similar in the case of a very fierce fight that took place between Prussian dragoons and Austrian lancers. The Austrians had a great advantage as long as they remained in the narrow streets, but the dragoons being somewhat worsted in the commencement of the fight retreated; the lancers were foolish enough to come out from their point of vantage, and then the dragoons rode them down. Therefore it is very hard to say in a downright stand-up fight which has the best of it. Lieutenant Graves made a slight mistake in speaking about the Prussian dragoons being heavier men than the hussars. The Prussian dragoons and the hussars are the same sized men.

Lieutenant GRAVES: I referred to our hussars generally.

General WALKER: If it is any consolation to gentlemen here, I may state that the Prussian dragoons and the hussars weigh about 1 lb. to $1\frac{3}{4}$ lbs. more or less than ours do on an average; I really do not know which it is. There is not a single difference of weight in the equipment of the two armies; our light cavalry and theirs are as nearly as possible of the same weight, for the dragoons are light cavalry.

NAVAL ESSAYS

HONOURABLY MENTIONED.

SUBJECT:

GREAT BRITAIN'S MARITIME POWER: HOW BEST DEVELOPED AS REGARDS—

1. FIGHTING SHIPS.
2. PROTECTION OF COMMERCE.
3. NAVAL VOLUNTEER OR SUPPLEMENTAL FORCE.
4. COLONIAL AND HOME DEFENCE; THE CLASSES, ARMAMENT, AND DESCRIPTION OF THE VESSELS NEEDED; AND THE ORGANIZATION REQUIRED TO SECURE A POWERFUL AND ECONOMIC IMPERIAL NAVAL FORCE.

GREAT BRITAIN'S MARITIME POWER, HOW BEST DEVELOPED, &c.

By Lieut.-Commander James B. Haye, R.N.
(China Station.)

"Organization and Decentralization."[1]

I.—*Fighting Ships.*

In considering the development of our maritime strength as regards fighting ships—

It may be assumed that it is the province of the naval officer to represent to the naval architect and engineer the qualities that are desirable for the fighting ships, designed to perform each particular class of service, and to state the relative values and prominence to be given to the different qualifications, as draught of water, speed, coal-capacity, &c., to enable these vessels to perform the particular duties allotted to them. The naval architect and engineer will then have to calculate how far it is possible to combine these qualities, and what modifications are necessary or desirable. It is, therefore, idle to enter into questions of expense and construction without an intimate knowledge of the subject.

It is proposed to arrange the present ships of the Navy in classes, according to the work required of them, with remarks and comparisons, and to consider some of the questions of armament, armour, &c., which bear on the subject.

Naval architects might, with advantage, serve a time in the fleet.

Class A.

Would consist of the exceptional and experimental ships which it will be necessary to build, in order to keep pace with foreign nations in the rapid advance of modern invention and the development of naval warfare, especially as regards the Torpedo and the Ram.

H.M.S. "Inflexible," for instance.

The number of these vessels will necessarily be limited, but we should always have enough of them to hold our own at home and in the Mediterranean. Ships, of this class especially, will require

[1] The writer regrets that want of time prevents him completing his programme, or sending a fair copy of his essay.

auxiliaries; in fact large ironclads will probably in future become the centre of a small group or squadron.

In this class would be also included—

The Ram, without gun power, and with or without
The Torpedo, or submarine gun or rocket;
The very fast Torpedo Boat for harbour and coast defence;
And the Circular Ship, or some modification of it.

The value of these will have to be decided by experiment.

Experiments are also required to ascertain the best method of strengthening the bottoms of ships to resist the effect of torpedoes. Many ways have been proposed:—Sheathing all the ironclads with wood; increasing the number of cells and filling them with cork; placing armour between two layers of wood-planking, or using inside-armour in the wake of boilers and engines; but no definite conclusion as to the value of these plans can be arrived at until they are tried.

The penetration of steel projectiles at various angles, the effect of bursting charges of gun-cotton, and the resistance of steel and chilled armour, especially when placed as turtle-backs to torpedo vessels and rams, will probably greatly influence future naval construction.

Class B.

Ironclads of light draught of water for the defence of our rivers, harbours, and coasts, and for offensive operations in shallow water.

We have already two typical vessels which seem nearly perfect for this duty, viz., the "Cyclops" Turret Ship, and the "Glatton" Turret and Ram.

	"Cyclops."	"Glatton."
Tonnage	3,430 (2,107)	4,912 (2,709).
Horse Power ..	1,660 (250)	2,868 (500).
Armour	8-inch	12-inch.
Guns	Four 18-ton	Two 25-ton.
Speed	10 knots	12 knots.
Coal Storage ..	120 tons	240 tons.
Draught	Aft. 15½ ft., Forward 15½ ft. ..	Aft. 22 ft., Forward 20 ft.
Crew	150 men	200.

Both these vessels, however, have double screws, very liable to be fouled by entanglements.

It is a question how much their draught will be increased when the superstructures, mentioned by Mr. Barnaby as necessary to make them sea-worthy, are added.

The "Cyclops" might, perhaps, be more efficient if she had a ram-bow, and carried one 35-ton gun in each turret, instead of two 18-ton guns; and the "Glatton" by carrying two 35-ton guns, instead of two 25-ton guns. Both would probably be improved if their motive power were hydraulic, and they were double rams.

The "Cyclops" could pass in-shore along the coast from Dover to Yarmouth, and enter the Medway or Harwich Harbour at any time of

tide, and in any but exceptionally rough weather, and this should be the standard for the subdivision of Class B.

The test of sea-worthiness for the "Glatton" and her subdivision should be ability to keep the sea during a North Sea winter gale; she would be suitable for the Home, North Sea, Channel, and Irish Channel Squadrons.

All this class should have their bottoms strengthened structurally, to enable them to resist the effect of torpedoes, and of taking the ground.

They should have steam capstans aft as well as forward, and stern anchors, bitts, &c., as well as bowers.

If, as Captain Scott suggests, the capstan engines can be utilised for working auxiliary hydraulic steering jets, it would be a great assistance to them in narrow waters.

These vessels, in common with all turret ships, have the defect of being unable to carry small guns on their upper deck for defence against torpedo-boats, without confining the arc of training of their turret guns, unless it may be possible to mount such guns on the superstructure.

Although it is advocated by many that our coast may be defended more economically by swift torpedo-boats and floating gun-carriages, which will undoubtedly be required in great numbers, it must be remembered that these gun and torpedo-boats can be destroyed by very light guns, and that for efficient coast defence (or attack) we require some heavy guns, mounted in armoured ships.

In fact, to operate efficiently, especially in narrow waters, a mixed force is required, each type being necessary and auxiliary to the other.

It may also be necessary to build floating forts, with or without steam power, according to the locality for which they are designed.

Class C.

Ironclad Line-of-Battle Ships without Sail power.

The "Thunderer," "Devastation," &c., represent this class.

Doubts have been entertained as to whether these vessels possess a sufficient reserve of floating power and stability, in case of serious injury in action, when light, and when short of coal and stores.

Should, however, they be secure in this respect, they may be considered as one of the best types of a first-class fighting ship for combined action.

Their guns are quite heavy enough for any practical purpose.

The absence of heavy masts and rigging enables them to steam well head to wind; and, while they have all the advantages of twin screws, the risk of fouling them is reduced to a minimum.

Their most valuable quality is decidedly their great coal-carrying and steaming power.

Their defects consist of the inability to carry a sufficient number of small Gatling and other guns for defence against torpedo attacks without masking their turret guns; want of distribution of fire if attacked by two or more smaller vessels; and want of power to depress their

guns sufficiently; the difficulty of carrying a sufficient number of steam launches of a suitable size for protecting them against torpedoes. There will always be great difficulty in lowering and hoisting such steamboats at sea.

Vessels of this class should never cruise without other auxiliary vessels to defend their weak points.

The turret system evidently loses its value wherever the guns are masked by masts, rigging, forecastles, or other obstructions.

Class D.

Ironclad Line-of-Battle Ships having Sail power.

No ironclad can be considered in the 1st Class whose main armament does not consist of at least 10 guns. In these vessels a single lifting-screw will be in great danger of fouling, but the screw-well will afford a fair chance of clearing it in a moderate time. A single non-lifting screw will be more difficult to clear. The twin-screws will not only be infinitely more liable to foul, but will be almost impossible to clear until divers can work in smooth water. The double-screw vessels, however, make a good fight when only one screw is foul. Many naval officers are of opinion that a foul screw will be the greatest danger to which a heavily rigged vessel will be exposed in action.

To meet this probability every ship should be ready to drop her torpedo-boats and nets, and although she may be rammed, the vessel that rams her should also be destroyed by the boats, or by spar-torpedoes. The Whitehead, however, would be the weapon probably used on this occasion. An hydraulic jet for turning the ship, worked by capstan or fire-engine, would be useful to a disabled vessel. These dangers may be removed with the masts and rigging on those stations where coal can be obtained, as the Home, Channel, and Mediterranean. We cannot afford to throw away a single chance in our favour.

Of all the types of masted ships proposed, or actually built, the "Victory," as designed by Captain Scott, R.N., seems to be the one which combines the greatest number of advantages, both for 1st and 2nd Class ironclads, and even for the belted cruiser.

The "Victory" certainly gives the best distribution of fire, for fleet manœuvring, and for single action. The extent of armour is reduced as much as possible, while protecting the most vital parts.

The upper deck is clear for small guns, Gatlings, or rifle fire.

The curved iron deck affords additional protection to boilers and magazines.

Few of our ironclads carry the 10-inch gun; of those that do so, the "Alexandra," "Temeraire," and "Hercules," have the embrasure ports, or, as some call them, shell-traps. The danger of the battery being raked through these ports is recognised in the two first, by placing an armoured bulk-head to prevent it.

The two foremost guns of these ships, although well arranged for engaging vessels of less speed, would place them at a disadvantage in action with a "Victory" of equal speed and manœuvring power; even should the "Temeraire" gain a favourable position astern of

"Victory," the sides of the embrasure ports would guide the shell into her battery. A central longitudinal bulk-head would be desirable to divide the foremost battery, and still further it would localise the effect of the bursting shell, but it would also intensify it.

The "Iron Duke" class has only 12-ton guns so placed, that out of 5 on each broadside, she would seldom be able to bring more than 4 to bear on a vessel manœuvring for the purpose of avoiding the fifth.

This class would be improved by having a clear upper deck, with an 18-ton gun mounted *en barbette*, at the bow and stern, the remainder of upper deck being used for mounting small guns, and having a banquette for rifle fire.

Class E.

Cruisers.

This class embraces all vessels between the "Northampton" or "Inconstant," and the "Flamingo" or "Lily."

All cruisers should have their bows strengthened and shaped for ramming; and, where the size permits, should be fitted to discharge the Whitehead, or some similar torpedo, right ahead and from either beam.

Sail power should be dispensed with as far as possible.

In those ships intended for stations where sail power is necessary, the turbine should supersede the screw.

Protected cruisers will certainly be necessary in the North Atlantic and Mediterranean, and perhaps one or two will be required for each other station.

The protected cruiser should carry a few heavy guns amidships on the main deck, behind armour of at least sufficient thickness to keep out common shell, with heavy bursting charges, the remainder of the armour being placed so as to defend the vital parts alone, viz., steering gear, engines, crowns, and up-takes of the boilers, magazines, and shell rooms. The water line should only be protected in the wake of these vital parts, the floating power of the ship being attained, as far as possible, by multiplying the water-tight compartments, every advantage being taken of the best material, to ensure strength combined with lightness; perhaps the chilled armour, mentioned by Commander H. H. Grenfell, will take a prominent place in future ships.

The steering gear might be protected by an armoured compartment or trunk, the wheel ropes being carried forward through water-tight tubes, placed so low in the ship, as to avoid the necessity for armour at the water-line, between the main battery and the trunk.

Captain Scott's arrangement of armour in the "Victory" seems to afford the best protection with the least weight of material. The steering gear being low in the ship, the water-line armour and armoured deck might be dispensed with, before and abaft the battery. If it is considered advisable to carry more and lighter guns than the "Victory" does, the guns in the armoured battery might be reduced in size (the system being good with any weight of gun), the difference in weight being made up by mounting guns on the same deck before

and abaft the battery; but this would, probably, be a loss of fighting power.

It has been observed that in the "Northampton," a shell entering the side abaft the foremost bulk-head, if fired obliquely, would probably be brought up and exploded by the after bulk-head, causing great damage, though traverses have been introduced to localise the effect of a bursting shell; the weight of the traverses to be effective must be considerable.

Although a similar case might occur on board the "Victory," for instance, a shell coming into the unarmoured battery, before or abaft, might also strike the bulk-head and burst, but its action would be more isolated than in the "Northampton."

Though a protected cruiser might be all the better for armour round her entire water-line if she could carry it with ease, which is doubtful; it might be useful in all cruisers large enough to admit of it, to introduce the curved armoured deck, under the gun deck, but extending only from abaft the engines to before the boilers, touching the ship's side well under water, the space between armoured and gun decks being filled with reserve coal.

The "Inconstant" class might perhaps be treated in this way.

As cruisers will frequently have to chase, and perhaps sometimes to retire before superior force, the importance of efficient bow and stern fire is evident.

Of all the qualities required for this class, speed and coal-carrying capacity are the most important, the ship having superior speed can avoid action; if she fights she can choose the most favourable position, and if she has long range guns she can use them to the best advantage; if she meets an enemy of superior force, she can accompany and watch her till her intentions are discovered, and then steam off to give the alarm, or to give assistance.

The chief objection to the present cruisers is the lightness of their armament, the "Inconstant" being the only one efficiently armed. There is little doubt she would capture or destroy the "Raleigh" or "Shah" in a short time, the ships being equally well handled.

The six vessels of the "Comus" class will be a valuable addition to our cruisers, if they carry decent guns.

For the China station, cruisers are required capable of steaming well against the monsoon.

It is presumed that all vessels will now carry steam launches as a protection against torpedo-boats. Great speed will not be wanted, but the object to be gained will be facility in lowering and hoisting at sea.

Class F.

Other Vessels.

The twin-screw gun vessels, carrying 6½-ton guns, and drawing little water, are very efficient for river work, their only defect being liability to foul their screw; they are, however, getting old, and have been constantly in use.

The gunboats of the "Mallard" class are more useful for harbour and

coast work than for shallow rivers, as they draw more water than the twin-screw, their armament is not heavy, but is as much as can be practically worked on the beam without an inconvenient heel; having a simple lifting and well immersed screw they are better adapted for coast work and steaming against a head sea than the others.

When used on the coast, they would probably be more effective if armed with a 6½-ton gun forward, working under a light field-gun forecastle, and having two or three 20-pounder guns mounted on easily worked carriages and slides on their broadside, the two after ones being able to fire right astern. This arrangement would not, however, do in a river unless there was a convenient bend, as the ships would have to fight at anchor, or with their heads to tide or current.

The new gunboats of the "River" class being shorter and more handy with greater beam, might mount a 6½-ton gun forward instead of the two 64-pounders.

The gunboats or floating gun-carriages of the "Snake" class will be invaluable in the attack and defence of coasts and rivers. It will probably be necessary to greatly increase their number and size, the Chinese gunboats ("Gamma" and "Delta") being good specimens of the boat required. Mr. Reed's suggestion of forging stems, stern-posts, and other heavy forgings for vessels of this class, seems to be most valuable, perhaps the same stem and stern-posts would do for modified forms of gunboat; it is a question whether we should have time to put them together in case of sudden invasion, but for any other case of war they would be ready in time.

There will be a great demand for despatch and look-out vessels in case of war, and it is doubtful if merchant steamers could be spared to do this duty without great injury to commerce. Yachts might supply a few, but several fast vessels of the "Salamis" class are wanted to augment this branch of the service; they might be fitted to use the Whitehead, Spar, or Harvey's torpedo if required.

Every port in Great Britain should have one or more look-out ship with torpedo-boat, and floating gun-carriage.

Conning Towers.

Nearly all our ironclads are deficient in a very important particular, viz.:—

A well armoured conning tower, with a cover, proof against rifles, Gatling guns, and falling spars, capable of being used for defence against boardings, and sufficiently roomy to enable the Captain and his numerous staff (consisting of Commander, Staff-Commander, Gunnery-Lieutenant, Signal-Officer, and men, bugler, &c.) to have a good look-out, and to perform their duties efficiently without crowding, and to prevent damage to the steam steering-gear, telegraphs, voice-tubes, &c., which are of vital importance to the prompt handling of the ship.

A large semaphore should be placed on top, worked from inside; and a steam-horn for making signals when flags cannot be seen. The flags might be worked from the main-deck as recommended by

Commander Noel, R.N.; watches might be out at convenient places for this purpose, and voice-tubes laid to the signalmen from the Conning Tower. The electric light and light for flashing signals might also be worked from the top of the tower.

If this is considered important in an ordinary ironclad, how much more so will it be in a flag-ship, or group-leader? These ships should be specially fitted as at general quarters, the idea is to manœuvre the ship and control the various arms, guns, torpedoes, rifle fire, in as nearly a similar manner as would obtain in action; it would be clearly to the benefit of the service if the duty were carried on from the same place as it would be in action.

The "Swiftsure" has a small bullet-proof iron pilot-house on top of her exposed spar-deck, and just under the main-yard; it may be entered either by a door opening on the spar-deck, or by a small hatchway and ladder from the upper-deck battery.

Inside the house, which is so small that the view is limited, and that only two officers can find room to work efficiently, are the steam steering-wheel, the telegraphs to the engine-room and to the ordinary steering-wheel, which is worked under cover in the magazine flat, voice-tubes to the engine-room, protected-wheel, and two batteries; on each side is a director and an electric firing key. Every naval officer knows that a Captain must have a numerous staff, and a well-considered system of communication to all parts of the ship, which must be previously arranged and practised, to render it possible to manœuvre an ironclad efficiently in a fleet action.

Suppose the "Swiftsure" to be engaged with an enemy who was aware of this weak point in her equipment, the enemy would probably direct a severe fire from rifle and Gatling guns on to the spar-deck of the "Swiftsure," for the purpose of driving the Captain and his staff under cover, but as there is only room for two in the pilot-house, where are the others to go? If they remain exposed on the spar-deck they will be certainly slaughtered without benefiting their own ship. The enemy would also direct a fire of small guns and grape-shot at the pilot-house, and would probably destroy it with its fittings and the officers inside. Besides this there is a fair chance of the pilot-house being crushed by gear falling from aloft, or at least the screw might be impeded, and the door set fast by falling gear.

It may even happen that the steam steering-gear may be disabled, and even locked, while the helm is over one or two turns; and as with the present arrangement the gear cannot be disconnected under five minutes, the ship will be unmanageable during that time. Perhaps a system of clutches, worked by a lever might enable the steering-gear to be disconnected almost instantaneously.

Injury to the telegraphs and voice-tubes would hamper the Captain very much, as passing the word along in an ironclad with the battery and water-tight doors closed, is not easy, the engines and helm could not be worked; how could orders be conveyed with that promptness and certainty which is essential to the proper handling of a ship in a fleet action?

This subject brings strongly before the mind the immense import-

ance of simplifying the transmission of orders, either by signal to ships, or by voice throughout the ship, and of reducing the necessary orders to a minimum; this would be effected as regards the signals in the manner recommended by Commander Noel in his book, "The Gun, Ram, and Torpedo." The system should be brought down to the internal organization of the ship, the Captain informing his officers previously of his directions for action, in case of every contingency. It may be fairly assumed that the fleet in which the fewest signals, and the ship in which the fewest orders are required to produce the desired result, will be most successful in naval warfare.

Another phrase of naval warfare is not sufficiently considered, viz., the probability of casualty to the Captain and the senior officer. It is quite possible that a comparatively inexperienced officer may be required to assume the command of an ironclad in the middle of an action—it is for this reason that the necessity for an armour-plated steam target-ship has been so strongly advocated, as it will afford lieutenants the opportunity of manœuvring their ships with a view to making the best possible use of their gun power, and it is most essential that ship-handling should be practised as early as possible in every officer's career, and that every officer who would succeed to command of ship, quarters, or any other particular duty, should be occasionally given the opportunity of doing so.

Ironclad target-ships with steam power are indispensable if it is desired to raise the gunnery practice of the Navy to its proper standard, of which it falls far short at present.

Commander Wallace B. McHardy advocated these vessels in a paper, written in the "Journal of the Junior Naval Professional "Association" (now unfortunately extinct), in a most convincing manner; he also pressed most strongly the importance of eye-training and judging-distance practice; the same subject has been so ably handled by the officer named above, and also by Commander W. Dawson in an article on "Naval Science," "Naval Gunnery Training," and elsewhere, that little more can be said on the subject, except that there are a great many officers in the Navy who believe that these vessels are absolutely necessary to obtain the full value of our guns.

While it may be safely asserted that the Navy falls far short of a proper standard in gunnery practice, it is not the fault of the men, who show the greatest aptitude for accurate shooting, and who are at present equal if not superior in skill to the men in foreign navies; but no man can become a good seaman-gunner who has not the opportunity of firing at a moving target, judging his own advance, and having the position of his shot with the true and estimated distance carefully registered, that he may find out his "personal "error," and correct his mistake.

With our present system of few and heavy guns, of firing valuable ammunition, and with such immense stakes resting on good shooting, it must obviously be of the most vital importance that the projectile should do its duty, and not be thrown into the sea.

This is perhaps the weakest point in the Navy, but it can be easily and cheaply remedied by using some obsolete ironclad as a target-ship;

or, still better, building special targets, and by firing from barrels fixed to the gun, using special sights suitable to the trajectory of the barrel. The target-ship might be steered on a previously determined course, or the officer coursing her would manœurve her by aid of mirrors or of the camera obscura in perfect safety (electric steering might be used).

Officers would have the invaluable practice of handling their ships of various classes so as to keep their guns bearing, and make the most of their gun power; it would cause the men to take a lively interest in their shooting, and to carefully observe their own defects; it would enable officers to arrive at a very close approximation of the value of the various systems of bow and stern fire, firing at a rapidly approaching or opening object—direct or oblique—shot, shell, case, Gatling, rifle, &c. In fact it would be the heart and soul of gunnery, which, without it, is labour in vain.

The Coast Artillery would also be much benefited by practising at a moving object.

Target-boats steered from the ship by electricity might also be introduced for rifle practice.

Torpedoes.

Harvey's torpedo, when carried, should be hung outside ready for slipping, but they should not be let go till they are wanted; otherwise they may cause embarrassment in handling the ship. There should be a ready means of cutting them adrift instantly when desired. The chief use of this weapon in large ships will be to deter an enemy from ramming, as, if he failed, and passed close, the torpedo would take effect.

It will be useful for despatch vessels and merchant steamers, especially where they are manœuvred for the use of this arm alone.

Its disadvantages are, the great amount of practice that is required to use it effectively, the complication of breaks and reels, and the exposure of the men working them to rifle fire, the danger to other ships, and of the tow-line fouling the ship's own screw.

It is doubtful if this torpedo will ever play a prominent part in future naval warfare, its effective range being limited by the length of tow-line that can be used with advantage.

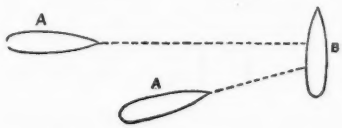
The spar-torpedo will probably be extensively used, as it is cheap and simple in its action; can be easily extemporised; does not require any great skill in handling, and can be kept in hand till the moment when it can be successfully applied. Its use for offensive purposes will probably be confined to sloops, gunboats, and steam launches, the latter especially fitted, but even in this case, the Whitehead would be preferred, if obtainable; a combination of boats would probably be necessary. The spar-torpedo will also be used defensively from the sides of larger ships.

Torpedo-boats attacking a ship at anchor will probably have to oppose two lines of obstructions, and to engage other torpedo and guard-boats; they would also be exposed to a severe fire from rifles, Gatlings, and of grape and case, directed by the aid of the electric

light, therefore torpedo-boats should attack in numbers and from different quarters.

The use of the instantaneous fuze would be preferable to electricity, as simplicity in torpedo work is most desirable. Whitehead's torpedo seems to be the most deadly of all at present, and no doubt this, or some other fish-torpedo will, when quarter speed is obtained to reduce the effect of disturbing causes to a minimum, and to ensure regularity of course, revolutionise naval warfare. To increase the chance of success, it should be used in great numbers, to compensate for its inaccuracy; but it cannot be stowed in great numbers on board ship, and as, when once started, it is gone beyond recovery, it will, probably, for the present, be kept in hand till it can be used with certain effect.

If fired from the bow right ahead, it may be considered as an auxiliary to the ram, as it could be discharged effectively from A, whereas B, though escaping the ram, presents a good target to the torpedo, would have little chance of hitting A, with one fired from her broadside.



When the Whitehead torpedo is fitted on the broadside it will, probably, be fired in the same manner as the guns, the enemy passing close after failing to ram.

If fitted to start from the mess-deck or steerage of a vessel of the "Iron Duke" class, it could not be depressed so as to strike the bottom of an enemy passing very close; but if used from the sail-room or chest-room flats, the tube being under water, it would strike the enemy's bottom in a weak point.

Wherever Whitehead's torpedo is fitted on the beam, Harvey's torpedo may be safely dispensed with.

In future, every ship large enough to permit of it will, most likely, carry Whitehead's torpedoes, fitted to fire both right ahead and on the beam.

It may be doubted if torpedo-warfare will be really developed, until a separate torpedo corps is formed — the present Royal Engineer Torpedo Officers and Companies with the Royal Navy Torpedo Officers and men, and a proportion of Royal Naval Engineers, forming the nucleus of the corps. As the torpedo is so essentially a maritime weapon, the corps should be fed from naval officers of the rank of Sub-Lieutentant or Junior Lieutenant, who show aptitude for the work, and who pass a qualifying examination in the scientific and theoretical branch of the subject, the men being recruited from those seamen, gunners, and divers who seem most fitted, and a proportion from skilled artificers from the Royal Engineers, the whole being under Admiralty control.

Sail Power for Fighting Ships.

In the opinion of many naval officers, full rigged ships—however valuable in peace-time for the purpose of keeping up the nerve and activity of the seamen—will, in time of war, find their sail-power a fertile cause of disaster.

Sir Thomas Symonds, K.C.B., in a letter to the First Lord of the Admiralty, dated Torquay, June 1, 1874, and afterwards published in the newspapers, writes, with reference to the "Vanguard," ". . . . " To carry large masts, the greatest enemy of all on board."

Nothing can well cripple a ship more than a foul screw.

Falling spars, blocks, &c., would cause many casualties, and would also impede the working of the upper-deck guns. Large masts and sails retard an ironclad when steaming head to wind, more than they would help her sailing with a fair one.

If the heavy masts were removed, ballast would be unnecessary, the draught of water would be lightened, and the sail and store rooms might be utilised for stowing coal or torpedoes.

It may be safely asserted, that no other nation holds such admirable positions throughout the world for coaling depôts as Great Britain; this will give her an overwhelming advantage in maritime warfare, provided only she takes care to make them secure and keeps them well supplied.

As long, therefore, as we hold these depôts, sail-power may be dispensed with to a very great extent,[1] except on some stations where the coaling stations are few and far between, as in the Pacific and South Atlantic. The advantage of hydraulic propulsion for those cruisers obliged to carry sail is obvious.

Cruisers with sail-power should be thoroughly efficient under sail alone. Sailing trials would be necessary to prove them so; they should have a light spar-deck to protect their guns from falling gear; they would require a smart ship's company to make the most of the sails, and to prepare the ship quickly for action, with spare hands for prize crews.

North of the trade winds in the Atlantic, neither ironclads nor cruisers should be masted for sailing.

The Singapore division of the China station, for instance, would not require sail-power, neither would the vessels permanently attached to the depôts, as their radius of operation is limited.

Armament.

Although heavier guns must be carried in special ships, to compete with foreign Powers, the 35 or 38-ton gun may be taken as the most suitable for the B and C classes, and for the "floating gun-carriages" that will be necessary for attack and defence in shallow water.

No First Class Ironclad should carry a less powerful plate-piercing gun than the 10-inch of 18 tons, which combines great power with perfect handiness, and may, therefore, be considered the most effective gun for general service.

[1] Other nations could not so well dispense with sail-power.

The remainder of their armament should consist of 12 or 20-pounder guns for firing at torpedo-vessels, the enemy's ports, &c.; but it is essential that they should be mounted so as to afford every facility for rapid aiming and for giving great depression. Flatness of trajectory will be indispensable for these guns to compensate for errors in distance, when firing at a rapidly approaching object. Captain Scott's remarks as to the necessity of having an ample proportion of steel projectiles, with punching heads for piercing armour at an angle, and for penetrating under water and also as to the use of the most violent explosive that safety will permit for the bursting charges of shell, are most convincing. The iron rib in his system of rifling would so strengthen the shell, that combined with the increased strength of metal (steel), the size of the chamber for the bursting charge could be considerably increased.

Swift torpedo-vessels will not be able to carry any very great thickness of armour, which will, however, probably be of very superior metal, and in the turtle-back shape—to meet this it may be considered advisable to construct Gatling guns carrying elongated steel bullets with flattened heads, and weighing about one pound, for the purpose of penetrating the steel mantlets of the torpedo-vessel.

Case-shot should be increased in weight as much as possible without injury to the rifling, or rather grape-shot should be re-introduced for special circumstances when injury to the gun is of less consequence than the destruction of the ship. The supply of case is at present insufficient, and there is no grape.

For the older iron-clads and the cruizers of frigate-class, the 9-inch gun of 12 tons should be carried, and if possible 10-inch guns should be carried *en barbette* in the bow and stern as in the "Temeraire."

The bursting charge of the 9-inch common shell is 19 lbs. as against 20 lbs. 4 oz. in the 10-inch, which gives the 9-inch an advantage for the work generally done by cruisers.

As our wooden cruisers may have to engage ironclad ships, and strong forts (stone, earthwork, or even ironclad) it is essential that at least the larger cruisers should carry some 10-inch and 9-inch guns, and in the smaller vessels they should carry two or more as heavy guns as possible at the bow and stern.

The $6\frac{1}{2}$-ton gun is the smallest that should be carried by any but gunboats; it will pierce some of the weaker ironclads at moderate range, and carries a double shell with a bursting charge of 10 lbs. 12 oz.

The $4\frac{1}{2}$-ton gun and 64-pounder are very much crippled in consequence of their only projectile being a weak cast-iron shell for general purposes; both these guns should have a proportion of solid shot for firing at forts.

As boats will play an important part in future warfare, the number of pistols supplied to ships should be greatly increased, and buck-shot cartridges supplied for rifles.

Rockets are probably capable of much further development, especially as regards weight and accuracy of fight, and their great length would facilitate their penetration under water; range-tables

and sights for aiming would be required. It is also probable that mortars will be extensively used for counter-mining torpedo defences, or for throwing grapnels.

Bow and Stern Fire.

The value of bow and stern fire has been questioned on the following grounds :—

On ships meeting with intent to ram, the smoke of a bow-gun would obscure the Captain's view at a critical moment.

The closing of the two ships, and their separating if they failed to ram, would be so rapid that only one round could be fired from each bow or stern gun, and with very slight chance of hitting.

Bow and stern fire under the above conditions would probably be useless, and bow-fire positively injurious. It may be assumed that in fleet actions and in actions between single ships when ramming is the object in view, the guns will be laid near the beam and fired in broadsides in passing the enemy, when failing to ram.

Still powerful end-on fire should be retained for use in special cases, —for instance—

It may happen, as the result of a *mêlée* or other cause, a vessel A may unfortunately find herself with regard to another vessel B in the position shown in the diagram.

Unless A is so far ahead as to be able to turn before B can reach her, she must keep her course, as every alteration of it will enable B to close.

If B is the faster, she can eventually overtake A, but the difference of their speed may be small, in which case, if A has good end-on fire she may have time to cripple B before she is overtaken; on the other hand, if B is slower, but has good bow-fire she may cripple A before she can reach a position of safety. If the speeds are equal, the vessel with the most powerful end-on fire will have a clear advantage.

If both are of equal gun power, B will have the advantage in proportion as the bow is less vulnerable than the stern; in this position A would have the advantage of being able to drop torpedoes or entanglements.

How far a Whitehead torpedo, fired from A's stern or from B's bow, would be deflected by the wash of A's screw is doubtful; A, however, would have the advantage of going in the same direction as the torpedo, which would thus have to travel further, whereas B would be meeting it.

Suppose the "Bellerophon" to be in the position of A, and both ships are steaming 14, 12, or 10 knots, the "Bellerophon" turns her half circle in about 2 min. 5 secs., and must be respectively at least 971, 833, or 693 yards ahead before she can venture to turn, these being the distances B would pass over at the speeds named in 2 min. 5 secs., without making any allowances for misjudgment of distance or other disturbing causes.

If the "Bellerophon" going 12 knots is within the limit of danger in turning, say roughly 850 yards, and the excess of speed of B is two knots, she must keep her course, but 11 min. 45 secs. must elapse before B can ram her, during which time, at short range, decisive results might be obtained by the guns or torpedoes.

It is stated (page 280 of No. LXXXVI of the "Journal of the "Royal United Service Institution") that the "Devastation" can reverse her powers as a ram and steam full speed in an opposite direction in 2 min. 2 secs. It is doubtful how far it would be advisable to use her stern as a ram, or how she would steer under stern-way.

All-round-fire would be most useful in case a vessel was disabled in action if she was engaging more than one object, as scattered forts or perhaps a fast torpedo vessel on either quarter, if at any time she meets an enemy inferior in speed and end-on fire, in which case she might chose an advantageous position, although the other ship throws a heavier broadside: and, also, if she gets on shore—which must be expected in blockading an enemy's coast when lights are out and other marks removed—for in war time many risks must be run to make success possible.

The best method of obtaining efficient end-on fire seems that proposed by Captain Scott, R.N., for the main-deck of the "Victory," in No. LXXXVII of the "Journal of the Royal United Service Insti-"tution." In ordinary cases the gun would be kept on the beam, with the ports not in use shut, and shifted to the other bolts for special occasions.

The only objections seem to be that in case of an enemy's bow striking in the angle formed by the projection and ship's side, her stern would be thrown round and she would penetrate the "Victory's" side, whereas if it was smooth she might glance along it. This might be remedied by a sweep piece filling up the angle, and also the weakening of the armour by having three ports for one gun; but heavier ports with powerful opening and shutting fittings might be employed to keep out projectiles, and to save the men from the concussion of the adjacent gun when trained on the bow or quarter.

With regard to the bow and stern fire from the upper deck of the "Victory," it is a question whether two lighter guns would not be more useful in general service than the one 18-ton gun, as in chasing or being chased, the enemy might, if handier and swifter, yaw so as to necessitate the gun being shifted to the other fighting bolt, causing delay and a reduction in the number of rounds fired; whereas if the other ship had two 12-ton guns she could always have a gun bearing on the "Victory."

The most important reason for having the two lighter guns, is the probability of the ship being attacked by two or more fast torpedo-vessels at the same time. If the single heavier gun is preferred, it would probably be more effectively mounted *en barbette*, as in the "Temeraire," but with a gun mounted in this manner, unless it recoils under cover to load, the crew would suffer very much from rifle fire.

The "Hotspur" or "Rupert," having only one turret and that one forward before the funnel, would find themselves in an awkward

position if they were caught, like A in the diagram, by a vessel of equal speed and handiness.

The position of B is called by Admiral Ryder the "weather gage" of future actions, (see No. LXXIX of "Royal United Service Institution Journal"). Attention is also forcibly called to the value of a double ram-bowed vessel worked by the turbine.

II.—*Protection of Commerce.*

We cannot protect our commerce without a sufficient number of outlying depôts.

If these are not securely defended, they will be captured by the enemy, and used as bases of attack against our commerce.

Every Government employé at the depôt should be trained to some branch of warfare, and be under military law.

The male civilian population between certain ages should be obliged to become efficient members of the Local Defence Corps, which should be commanded by Naval or Army officers according to the particular branch of the corps.

On the outbreak of hostilities, the depôt should be placed under martial law.

Depôts should have despatch, look-out, gun, and torpedo-vessels permanently attached to them; and, in some cases, even mastless ironclads.

The telegraphic, signalling, and range-finding systems should be as perfect as possible, and include the means of repairing telegraphic and torpedo cables.

A system of ground-torpedoes and mortar-fire is essential to the defence; also, if possible, plunging fire from scattered guns.

The Moncrieff system of mounting guns should be largely used, as it is most difficult for ships to disable guns mounted in this way.

In consequence of the development of Whitehead's torpedo, the value of a mole covered by guns has greatly increased. The entrance of the mole could be closed by a boom with chain or wire nettings attached.

It is essential to have places where vessels can lay alongside in safety with their fires out, to effect small repairs, or to clean boilers.

The mole affords every facility for coaling, for cleaning coal-ships, storing and for protecting coal, and for effecting repairs under water by means of divers or a coffer-dam.

Where there is little rise and fall of tide, it may be constructed so that in some parts a ship may fire her guns over it, and have her water-line and bottom protected.

Iron pontoons filled with ballast and sunk so as to be a few feet above the high-water mark; or iron booms, built on the cellular system, with chain-nettings, might be used to protect vessels under repair in such places as Simon's Bay.

A 1st-class depôt should be one at which both men-of-war and merchant steamers could be docked and have their machinery repaired, fill up with coal, provisions, and warlike stores, send sick men to hospital, and draw men to fill vacancies.

The following places should be ranked as 1st-class depôts:—

Malta, Bombay, the Cape (Simon's Bay), Sydney or Melbourne, Halifax, the Falkland Islands (Stanley Harbour), Vancouver's Island, Singapore, Hong Kong, Bermuda, and Jamaica, eleven in all.

Where these places fail to satisfy the above-mentioned conditions, they should at once be raised to that standard.

A 2nd-class depôt should at least be a securely defended coaling-station, with ample supplies of provisions and warlike stores.

The following places should be ranked as 2nd-class depôts:—Antigua, Quebec, Saint John's (Newfoundland), Heligoland, Sierra Leone, Ascension, St. Helena, Mauritius, Aden, Perim, Karáchi, Galle, Trincomali, Andaman Islands, Penang, Labuan, the principal ports in Australia and New Zealand, and Fiji Islands.

Gibraltar stands by itself as our most important outpost, but it will be a coaling station for men-of-war rather than for merchant steamers.

Our cruisers will be required to watch:—

All places where we possess stores of coal undefended; also those neutral ports from which hostile cruisers could be fitted out, and where they can replenish with coal; among others, for instance:—

Brest, Vigo, Lisbon, Cadiz, the Azores, Madeira, Canary and Cape de Verde Islands, Fernando Po.

The United States Atlantic ports, Aspinwall, Havana, Martinique, Guadaloupe, St. Thomas, the Brazilian ports, and Monte Video.

Manilla, Ke-lung, Batavia, Surabaya, Macassar, Japan, and the numerous anchorages on the coast of China.

Valparaiso, Callao, Panama, San Francisco, and the Sandwich Islands.

A nation intending to go to war with England, but not having a sufficiently powerful fleet to attempt an invasion, or to engage our ironclad squadrons on equal terms, would exert all its power for the destruction of our commerce.

Attempts would be made to block the Suez Canal in several places, under the pretence of accident by collision, fire, explosion of cargo, &c. To cause incendiary fires in our arsenals, dockyards, coal stations, and on board our ships.

Trusting to slow ironclads, gunboats, and torpedoes for home defence, the fast ironclads, wooden frigates, and corvettes would be sent to neutral ports to await events. These ships would carry as many men as possible for distribution.

Secret agents would arrange to purchase suitable vessels for conversion into armed cruisers.

Certain unfrequented harbours would be selected as rendezvous, at which, on a given date, these steamers with coals, provisions, and warlike stores would concentrate and be organized under the protection of the men-of-war.

Large bounties and promises of prize-money would enable them to complete their crews.

Depôts of coal, &c., would have been secretly established (perhaps

buried) at several out of the way places, and large supplies would be obtained from captured vessels.

The concentration and organization would probably be effected without molestation, and the newly-created force would be greatly superior to our local squadron.

They would proceed without delay to attack our commerce and colonies, overwhelming in detail our slightly defended coaling stations, burning coal, stores, &c., with wooden piers, jetties, and lighters, destroying patent slips, docks with their caissons and pumps, steam factory plant, &c., blocking up moles, cutting telegraph-cables and wires in such a manner as to prevent their quick repair, dismantling forts, lighthouses, removing beacons and buoys, capturing such vessels as they require for cruisers or store-ships, and sinking the remainder in such positions as to obstruct the navigation and trade. Their chance of success in these raids will depend chiefly on secrecy, and on being beforehand with us.

Should they meet with reverses or a superior force, they would disperse and continue their depredations wherever the best opportunities offered.

Their cruising grounds would be governed by the relative value of our trade in the different seas, and by the means of obtaining coal. Probably their operations would be confined to the North Atlantic, south-east coast of America, the inlets in and about the Magellan Straits and the Eastern Archipelago.

It must be remembered that the success of the "Alabama" as a cruiser depended largely on the use of our coaling stations.

To avoid protecting two routes, our trade with the East and with Australia will very likely be carried on entirely through the Suez Canal; should, however, any accident happen to the Canal, the importance of the Cape could hardly be over-estimated, and it is almost certain that an attempt would be made to capture Cape Town and Simon's Bay, unless they are well defended.

Our merchant steamers must be lightly armed, fitted for using Harvey's torpedoes, strengthened at the bow for ramming, and divided into several watertight compartments.

The guns supplied would depend on the stores of guns, ammunition, and gun-carriages available, and would probably consist of converted 64-pounders (revolving), with Armstrong 12 or 20-pounders on the broadside. The crews of these steamers must include enough officers and men of the Royal Naval Reserve to work the guns and torpedoes efficiently.

The fast ocean steamers would trust principally to speed for safety; but as they approach the narrow waters at either end of their passage, or where they have to pass through straits such as those of Gibraltar, Malacca, Sunda, Magellan, Bass, &c., they must be defended locally by our cruisers, who, having a protected coal depôt near at hand, could afford to chase at full speed, whereas the enemy's cruisers would have to economise their coal. The system of convoys must be revived for the slower steamers, the speed being regulated by the coal-carrying capacity of the men-of-war attached.

The convoys should be small, so that they may not be thrown into confusion by an attack. Ten merchant steamers lightly armed might be convoyed by one man-of-war, and in case of being attacked by two or three cruisers should assume the offensive; or they might at any time be dispersed to re-assemble at a given rendezvous. Towing would be resorted to at times in fine weather to economise fuel.

One or two gunboats might be towed in summer.

Suppose a fast steamer, A, being in the open sea, observes an armed cruiser, B, ahead.

A has the following courses open to her:—

She alters course 8 points and tries rate of steaming, if she draws away from B she will soon be able to resume her course; but if not, she must bring B right astern, and trust to night or a lucky shot from her 64-pounder.

A may, however, catch B under sail with banked fires, in which case she can either ram B or pass her out of range; her cargo would probably be too valuable to run the risk of ramming.

The safety of B would depend very much on smartness in raising steam, shortening sail, and, weather permitting, lowering her torpedo boats.

This opens the question of the vessels required for cruising and their management; also how far private signals can be used between cruisers and merchant steamers.

Should cruisers act singly or in pairs, &c.

The cruisers are described under the heading Class E, in Part I.

III.—*Naval Volunteer or Supplemental Force.*

All our Reserve Forces for the Navy come under this heading.

The Royal Marines (Artillery and Light Infantry).

This corps must be considered the best and only reliable reserve for expanding the Navy to its war footing, for the following reasons:—

Few Royal Navy seamen, after leaving, seek employment in the merchant navy, and this small number is not likely to be increased, for after the comparatively easy work and comfort of the Royal Navy, they are unwilling to undergo the hard life of a merchant seamen, therefore, if they do not enter the Coast Guard, they take any employment ashore in preference to sea service, and naturally deteriorate as seamen.

Consequently, we cannot expect a large reserve from men who leave the Navy.

The Coast Guard would form such an excellent nucleus for a Coast Defence Corps, that it would be undesirable to withdraw them in any number from the coast in time of war. Some of the younger men might, with the Marines, be told off to man the Home Defence Ironclads, taking the duties of quartermasters, coxswains of boats, captains of turrets and guns, &c.

The organization of the Coast Guard is capable of being easily adapted to any requirements.

The chief duty of the men, who are all trained men, would be to supply the disciplined element in the Coast Defence Corps. Among

them may be found signalmen, seamen gunners, torpedo men, and stokers; most of them have been petty officers, and accustomed to take a leading part. Their local knowledge of pilotage, and their skill as boatmen, peculiarly fits them for torpedo work.

The system might, with advantage, be extended to the Colonies.

Only a small number of Coast Guard men, then, can be spared to join the fleet.

The Royal Naval Reserve are a most valuable body of men, and should be increased as much as possible; but in war time they will be wanted to form the principal portion of our merchant crews.

The bulk of our trade will probably be carried on by ordinary merchant steamers under convoy; they will be lightly armed, and will be required to act in concert with the men-of-war attached to them. Their crews will necessarily be more numerous, and a proportion of signalmen will be required for each ship.

In war time, there would be such a demand for Royal Naval Reserve men for the merchant ships, that few would be available for the fleet.

The Royal Naval Artillery Volunteers would be merged into the Coast Defence Corps.

The boys under training cannot be called an immediate reserve. They would be kept under training till about 18 or 20, and should not be sent into the general service cruisers in peace time before that age, especially when we consider the dangerous excess of young ordinary seamen among our ships' companies already in small ships, weak enough numerically. The greater part of these youngsters will, no doubt, grow up into able-bodied men; but at present, for the purposes of boarding, handling heavy charges, projectiles, and cables, or for sustaining continued hard boat-work, they are unfit to cope with the men who compose the crews of most foreign men-of-war. They swell the sick list whenever hard work is to be done, even in peace time. We must not commit the error of opposing boys to men.

If, then, we cannot get sufficient men for the fleet from the reserve of Royal Navy seamen, the Coast Guard, the Royal Naval Reserve, the Royal Naval Artillery Volunteers, or the training ships, we shall have to fall back on the Marines, and, in addition, such able-bodied landsmen and inferior seamen as we can get, in which case, perhaps, the Marines will be required for the maintenance of discipline. It will be more fitting to consider the Marines in their place as part of the standing Navy.

It is proposed to divide the Naval Reserve Forces into two branches, viz.:—

A. The Royal Naval Reserve (for general service).
B. The Coast Defence Corps (for local service).

A. The Royal Naval Reserve (for general service).

It is very desirable to create a good feeling between the Military and the Mercantile Marines, and, by careful management it may be possible, at some future time, to organize the two services in a somewhat similar manner to the French system. The change, however, must be gradual.

If trade is, in war time, to be carried on under convoy, the import-

ance of a clear understanding and perfect harmony between the men-of-war and merchant vessels under convoy is obvious.

A system of convoy organization and tactics should be compiled, in which the duties of every one, commanders in charge of convoy, of men-of-war and merchant vessels, owners and agents, should be so clearly laid down that no doubt can exist on the subject.

Encouragement should be given to the officers and men of the Royal Naval Reserve to perfect themselves in day and night fog-signals.

Those officers running to foreign ports where it is unusual to send our men-of-war, especially those in the Baltic and east of Calais, should be required to pass in the pilotage of those ports, and should have a distinguishing mark placed against their names.

Mail steamers and hired troop and store ships should be solely commanded, officered, and manned by Royal Naval Reserve.

In 1873 it was deemed advisable to introduce the new rank of Midshipman Royal Naval Reserve. It would tend to keep those officers efficient if they had to pass Admiralty examinations, in addition to those of the Board of Trade, and to produce certificates of good conduct and practical ability before being promoted to the rank of sub-lieutenant.

Sub-lieutenants Royal Naval Reserve should be required to make a short cruise in a man-of-war before being eligible for promotion to lieutenant.

If it is desired to foster sympathy between the Royal Navy and the Royal Naval Reserve, the drill ships should be fitted so that the men under training could live on board, subject to the ordinary naval discipline, and receiving rations.

These ships should be rigged, not for the purpose of teaching the Reserve seamanship, but to accustom them to our fittings and system of working together.

They should be officered at least by a commander and two lieutenants, one of the latter to be always on board, with a proportion of warrant officers, seamen, and marines (the seamen to be picked A.B.'s).

The Reserve would soon learn to prefer the comfort of a man-of-war to a dirty lodging-house.

There would be a canteen on board, and ample leave would be given.

By mixing with the permanent crew, mutual respect would be created, the Reserve would gradually be initiated into the manners and customs of the Navy, and learn that habitual neatness aloft, about the decks, and in their dress, which is so essential to discipline.

By this means, old prejudices would be softened down, a better organization would be rendered possible, and the men, when called out for service, would feel at home on board a man-of-war.

The weak point, however, in the training of the Reserve is, that they get little if any firing at sea, under the same conditions as would exist in action. They should also be practised at judging distance, and simple fitting of fuzes (letting the inside alone). As from the nature of their duties, merchant seamen in large ships are not good boatmen, and as they might have to assist in disembarking troops and stores from hired

transports, boating should be included in their instruction; but, above all things, the object should be to make them good shots with gun, rifle, and pistol, at moving targets, and firing from a moving platform.

To effect this, gunboats must be attached to each district. To save expense the old plan of fixing rifle-barrels on the gun might be revived and improved upon. The barrel should carry a projectile at least one pound in weight, and be fitted with special sights.

Lowering and hoisting boats at sea might also be practised.

The commander and other officers would have a good opportunity of learning and practising the pilotage of our own coasts (a weak point at present, especially on the east coast).

A large number of men might be passed through these boats, and they would be efficient and in their place if war broke out.

Officers who have passed in pilotage or torpedo practice should be distinguished by placing **P, T** against their names in the Navy List.

For the men the ratings of marksman (gun, rifle, and pistol), signalman, sail-maker, torpedo-man, and skilled stoker might be introduced, the latter to pass an examination at a Royal Dockyard or on board a first-class reserve ship. All boys' training ships should be under Admiralty control and naval discipline. As the present officers die out, vacancies should be filled up from the Active List by officers who have been employed in the Naval Training Service.

After a course in the harbour ship, the boys should serve a year or more under strict naval discipline on board one of the sea-going sailing training vessels attached to the home station; or in case of the Colonies, to the local one. The best should be attached to the Royal Navy. A certain number should receive special training as stokers in the coast defence vessels and dockyards. At the end of their course they should be classed and drafted into the merchant service as Royal Naval Reserve seamen or stokers.

The case of reformatory ships is a difficult one. The cargo of a merchant ship is very valuable, and bad characters should be weeded out as much as possible; as the standard of the merchant service improves, there will be less room for them, at any rate, doubtful characters are better placed ashore under the eye of the police, than in a merchant ship, where they can do so much harm; besides, the reformatory boys do not turn out so strong or healthy as the others.

B. *The Coast Defence Corps.*

It is proposed to expand the present Coast Guard into a Coast Defence Corps, which shall absorb all Naval Reserves and other corps, except the active Royal Naval Reserve for general service.

The Coast Guard men would be continued in their present duties, and would supply the principal portion of the disciplined element of the corps, in fact they would be the permanent staff.

The remainder would consist of:—

Pensioners and Reserve men from Royal Navy and Royal Marines who are willing to reside on the coast in their district.

The Royal Naval Reserve men (number to be limited at present)

who, belonging to coasters, or having served a fair time in the Reserve, may wish to join a home corps instead of the general service reserve.

The coast population, especially boat and fishermen, who would receive a small retainer, and would be specially suitable as pilots, and for working ground torpedoes.

The Royal Naval Artillery Volunteers should be invited to join, as also should be the Military Volunteer Artillery Corps of the coast towns, in which case they should be transferred from the War Office to Admiralty control.

The coast brigade of Royal Artillery would find ample employment at our fortified arsenals and dockyards.

Perhaps the Royal Marine Artillery would, after a certain service, be allowed to join the coast brigade, they would be well fitted for duty in those forts intended to engage men-of-war.

A system of training might be organized for boys who, though not wishing to become sailors, are willing to join the local corps, but boys should not be counted on the strength of the corps.

The Coast Guard is under the command of an Admiral Superintendent (whose staff consists of one secretary, two clerks, and one writer), and is divided into nine districts, each under the charge of the captain of the first reserve ship attached to that district. But in case of war these ships would be called away from their stations to form a squadron or to cruise, thus removing the district captain at a most critical moment.

The districts are subdivided into 73 divisions, commanded by inspecting officers, of whom 34 are commanders, 28 lieutenants, 2 navigating officers, and 8 Coast Guard officers.

These 73 divisions are again subdivided into 230 stations, each in charge of a chief officer (about equal in rank to a Warrant-officer Royal Navy), all of whom, with the exception of 38, have passed in navigation.

The appointments of inspecting officers of divisions do not seem to be made on any definite principle.

The officers range from commanders with seniority of 1864, through commanders 1874, and lieutenants of 1855 to lieutenants of 1868. In the case of lieutenants, though remaining on the Active List, they are considered as practically shelved.

The men consist of 4,000 well drilled seamen.

If the system is extended to the Colonies the force would be reduced.

To have an efficient Coast Defence Corps it must be entirely under the Admiralty, except within the limits of the fortified arsenals and dockyards, where a special local organization must obtain under joint naval and military control.

The expansion and re-organization of the Coast Guard is the basis on which the proposed corps is to be formed.

We have already—

An Admiral-Superintendent of Naval Reserves, who would have entire control of the A and B classes with their respective training establishments. His jurisdiction would extend to every part of the coast except the fortresses.

His staff, in addition to his secretary, should consist of—

A Captain Royal Navy, as chief of the staff and second in command.
A Staff-Captain or Commander.
A Colonel or Lieut.-Colonel Royal Marines or Royal Marine Artillery.
An Inspector of Machinery.
A Flag-Lieutenant (from gunnery branch).
A Torpedo Lieutenant.

A sufficient number of junior clerks and writers should be appointed to relieve the Admiral and staff from unnecessary clerical work, and enable them to devote their whole attention to their higher and proper duties of inspection and organization.

The Command of Districts.

A difficulty arises here from the fact that the districts are at present under the command of senior captains, who are also in command of the first reserve ships.

The officer in command of the district should be a senior captain, he should live on shore, and remain at his port in case of war.

The value of the first reserve ships is undoubted, but there can be no reason why the ship should not be commanded by a captain junior to, and under the orders of, the District Captain.

It may be objected that the expense is doubled, but the work done will amply repay the expenditure; besides it is of vital importance that the Coast Defence Corps should be officered in the higher ranks by Royal Navy officers.

Each Captain of a District should have a staff consisting of—

A Gunnery Lieutenant.
A Lieutenant Royal Marines or Royal Marine Artillery.
A Chief Engineer.
A Secretary (Assistant-Paymaster).
With a sufficient staff of writers (who should be trained men).

The District Captain would control—

The A and B classes.

The training and drill ships and mastless ironclads.

The gun, torpedo, look-out, and fast despatch vessels and their crews.

The batteries, field-guns, signal stations, and ground torpedoes in his districts.

He would furnish his chief with necessary statistics, on which the schemes of mobilization would be founded. His office would be in telegraphic communication night and day with each divisional head-quarters, with the office of the Admiral-Superintendent, and the military commander of the district.

He should be supplied with a series of numbered orders explaining in detail how he is to act in the event of certain contingencies. He should supply his divisional officers with similar orders.

On receiving the telegram "No. IV" (proceed in the execution of) he would know how at once to act without hesitation or delay.

This would be a step towards decentralisation and would leave the mind of the Admiral-Superintendent free to consider passing events, instead of being distracted by hurried organization.

The districts might be re-distributed with advantage and prominence given to those parts of the coast most open to invasion.

It is a question whether the district between Harwich and Dover, where the trade to London becomes concentrated, should not be commanded by an Admiral (junior to the superintendent).

The Command of Divisions.

Every division should, if possible, be under a Commander on the Active List.

The position will be a difficult one as the Divisional Commander will be the officer brought into more immediate contact with the men of a mixed corps, many of whom would be unaccustomed to discipline. Discipline is the weak point of all Volunteer forces. To ensure a reliable Coast Defence Corps, the duties and responsibilities of officers and men must be clearly defined, and, if necessary, a law passed, placing the corps while on duty under strict naval discipline, and giving the officers down to divisional officers the power of summoning the attendance of individuals, and of requisitioning whatever may be necessary to the corps, under severe penalties for disobedience or resistance. Half measures will be of no use in war-time.

The present number of Commanders on the Active List would not be sufficient to carry out the proposed scheme, as many would be withdrawn for sea service.

If it is not deemed expedient to increase the Active List, Lieutenants of 10 years' seniority, who are in all respects eligible for the rank of commander, but who cannot be promoted for want of vacancies, might be made commanders in the Coast Defence Corps and placed on a separate list. Before receiving the appointment, they should qualify in gunnery, torpedo-practice, and the local piloting of their district.

The Divisional Commander should have a staff consisting of—

A Sub-Lieutenant (promoted from Torpedo Gunner).
An Engineer.
A Carpenter (warrant officer).
A Chief Petty Officer (for office work).
A Sergeant Royal Marines or Royal Marine Artillery (as instructor of military drills).
One or two writers (who should be trained men).

It would be his duty to keep lists of the officers and men belonging to the corps, with their special qualifications, and would detail them accordingly as officers, pilots, and crews of the gun, torpedo, look-out, and despatch vessels, steam launches, and shore batteries, ground torpedoes, field-gun, and rocket parties, signalmen, &c.

To preserve vessels, boats, batteries, arms, and ammunition in working order.

Stations should night and day be in telegraphic and signal communication with each other and with the divisional office, which would also be connected with the district office, the adjacent divisional offices, and the nearest military post.

The station officers should remain as they are at present, but might receive the rank of sub-lieutenant.

Lieutenants-commanding, sub-lieutenants, engineers, and medical officers (as in the Royal Naval Artillery Volunteers) would represent the volunteer officer element—they might receive honorary rank on retirement.

Lieutenants-commanding should be required to hold a Board of Trade certificate as master and local pilot, with an Admiralty certificate in gunnery or torpedo.

The Coast Defence Corps would be expected to partially officer and man (with the Marines) the home defence ironclads.

To entirely officer and man the gun, torpedo, look-out, and despatch vessels attached to their districts.

To furnish pilots to vessels requiring them.

To keep a look-out off the coast, and to communicate intelligence to the shore signal stations, who would forward it.

To help a friend, or harass an enemy, within reach.

To prevent or delay a hostile landing.

They should be thoroughly drilled in simple squad drill and the rifle exercises (both of which should be condensed as much as possible). This much is absolutely necessary for the preservation of order and discipline, but playing at soldiers should be prohibited.

Every care should be taken to make them good shots with gun, rifle, and pistol, particularly when firing from boats and small gunboats on the move. They must be thoroughly practised in range-finding and judging distance, (the eye must be well trained), in boating, in the use of torpedoes of all sorts by night as well as by day, and in the construction of booms and entanglements for fouling screws (a proportion should be divers).

Simple field and Gatling gun drill.

Working shore batteries (drill adapted from naval gunnery).

They should be good practical swordsmen and know how to keep their arms efficient.

Armourers would be necessary in each division.

Ratings of S.G., T.M., T.O., Engine-room Artificer, skilled Stoker, Diver, Armourer, should be established.

It must be essentially a working corps. The uniform should be of the simplest and most serviceable kind. Each man should have a blanket, haversack, a small kit, and three days' provisions ready for use.

By the proper working of this system, the naval and military Commanders-in-Chief will be kept acquainted with the movements of the enemy, which will enable them to hold the home defence squadron and the field army in hand until the enemy has committed himself to his point of attack. The coasting trade would also be efficiently protected.

Wherever possible, batteries should be placed high, with command of special facilities for depression of the guns in order to obtain a plunging fire and force the enemy to take a distant position before he can elevate his guns sufficiently to engage them. Other low-placed batteries would be required, and Moncrieff's system used wherever it can be.

IV. *Colonial and Home Defence.*

Our best defence is to take the initiative—

1stly, by blockading the coast of a possible invader.

2ndly, by the despatch of combined naval and military expeditions to attack or threaten the enemy wherever he may be vulnerable.

In Blockading—

Extensive use should be made of mechanical torpedoes to shut the enemy in where desirable, and to form sheltered anchorages for our ships, the entrance only being defended by electrical torpedoes.

Wherever we wish to push our way, countermines with large charges, and utter disregard of the number used, will be indispensable.

This would necessitate large quantities of torpedoes, explosives, and torpedo stores being carried in company by transports specially fitted.

It would be necessary to lay telegraphic cables, and repair them.

As lights, buoys, beacons, &c., would have been removed by the enemy, a naval surveying corps should be attached to the blockading force, with the necessary material for relighting and buoying the coast, and for laying down moorings where necessary.

A service would be organized to keep up the communications and supplies of all sorts.

Coal depôts with steam cranes, floating factories with dockyard artificers, hospital ships, tugs, fire and explosion ships would be useful, if not absolutely necessary.

As regards the Expeditionary Force:—

The men composing it should be well trained and practised at disembarking and re-embarking troops, horses, guns, and stores, the use of defensive and offensive torpedoes, the demolition of forts, bridges, railways, telegraphs, &c., in fact to sink, burn, and destroy generally.

Boats in pieces should be in store for use in lakes or inland seas.

The organization of the forces for blockading and for expeditionary purposes would probably take some time; the greater promptitude with which they are despatched, the greater chance they will have of success.

The value of a large corps of Marines for expeditionary purposes is obvious.

In all purely defensive operations, the ironclads will probably be kept ready in hand, either at anchor or under easy steam, secured from surprise by numerous look-out vessels, which will also keep the Admiral fully informed of the enemy's movements.

As the safety of London is of the most vital importance to the Empire, and the coast from Hull to Portsmouth the most vulnerable to invasion, England should never be left without a powerful home squadron, independent of the coast defence vessels, and containing at least one or two of the "Devastation" class.

The true key of the position is obviously Dover or the Downs; but since the development of the fish torpedo, it would be undesirable for the squadron to lay at either place.

A harbour at Dover in which our ironclads could lay alongside a mole with their fires out, and without fear of torpedoes, is essential to the national safety.

The home squadron would not be drawn away from Dover until the enemy had committed himself to the point of attack. Ample information of the enemy's movements would be received from the numerous look-out ships, who would communicate with the shore stations.

At the proper moment, the squadron would receive their orders, and the deepest draught vessels could pass east or west from Dover at any time of the day or night, or state of the tide.

The next urgent necessity that presents itself is a similar harbour on the east coast.

These harbours are pressingly needed as harbours of refuge for merchant ships from an enemy, as well as in case of stress of weather (Filey has been proposed by authorities on the subject).

Sheerness (and the Medway) forms an excellent head-quarters for the light draught ironclads, which should be sufficiently numerous to enable us not only to defend our own coasts and harbours, but to operate offensively in the shallow waters eastward of Calais and in the Baltic.

We should also require at home—

A North Sea squadron.

An English Channel squadron.

An Irish Channel squadron.

The strength of the above would be adjusted to the circumstances of the war.

The head-quarters of the first-named squadron should be near the northern coal fields, and Milford Haven would be the head-quarters of the Irish Channel squadron, it has the advantage of being near the Welsh coal district, and would be a good base for sending troops to Ireland should that country be invaded.

There being so many large harbours in the north and south of Ireland, secondary stations would be required at Cork and Belfast Lough at least; fast torpedo rams will probably play a prominent part in our coast defence, but they will not be able to carry any large quantity of coal, or continue for a long time at a high rate of speed, consequently our vessels, especially in the Irish Channel and North Sea, will be close to their coal supply, which would give them an immense advantage as compared with similar vessels belonging to an enemy.

The present Channel Fleet might be called by some other name—Atlantic, Lisbon, or Gibraltar.

The other fleets and squadrons would remain as they are at present.

The number of ships required can only be determined by the strength of foreign navies (information on which subject is difficult to obtain), and the possible hostile combinations against us.

One of the most urgent requirements of an organized system of

Imperial defence is the establishment of a Naval Staff Corps and of an Intelligence Department. The chief of the staff should be an Admiral, and his head-quarters the seat of the Intelligence Department. The value of an efficient staff cannot be over-estimated. It frees the Admiral from unnecessary clerical work, supplies all requisite information promptly and in a well-digested form, and works out the details of the Admiral's plans, leaving him at liberty to attend to his higher and more important duties.

It would, then, be the duty of the Department—

To work out the details of the Admiralty schemes of action, prepared beforehand, in the event of hostilities with any nation or combination of nations.

To furnish specially qualified officers for service on the staff of Admirals and Commodores, and perhaps the staff of Governors of Colonies, and Commanders of mixed expeditions.

To collect full and reliable information on all subjects of professional importance, as, for instance—

Capabilities of British and foreign guns, their projectiles, traces of their trajectories, tables of angles of descent, penetrations at various angles, &c., and the development of torpedoes.

The dimensions, draught, turning power, speed, coal capacity, armour, and peculiarities of our own and foreign ironclads and other men-of-war (cruisers, gunboats, &c.).

To compile statistics as to the officers, men, and reserves of various nations, and tabulate the results of experiments.

To publish progressive text-books on tactics.

And to circulate the same periodically in a condensed form for the use of naval officers.

Officers of the Department should travel as necessary to obtain trustworthy information.

The Navy suffers from the following causes:—

As regards the officers—

The age of entry is so early that it is impossible to judge correctly the physical or intellectual fitness of the cadet for the service.

The Navy is generally employed in hot and enervating climates, which, together with night watch-keeping, and the frequent calls for duty, is very prejudicial to the acquirement of the theoretical knowledge now required.

The position of midshipmen on board a sea-going man-of-war, as combined officers and school-boys, is, to say the least, inconvenient.

There is no systematic training in practical seamanship, such as can only be obtained by a long course on board a sea-going sailing training ship, the cadet performing personally every duty that a seaman is called upon to do, from passing an earring or stowing a jib in bad weather, to steering the ship and getting correct soundings.

The present *vivâ voce* examination in seamanship is not a true test of practical ability as a seaman, or of being trustworthy as officer of the watch.

Instruction in steam should be given by a moderately long and

thoroughly practical course in the engine-room and stoke-hole, under weigh. This would give the cadet a lively interest in the subject, and would convince him of the importance of pursuing it further.

Officers generally have not the opportunity of handling vessels under steam or sail in narrow waters, of navigating or surveying practically, or of exercising steam tactics. At a sufficiently early period of their service, some officers pass four years as sub-lieutenants, doing duty as mates of decks in large ships, and spend a year or so on half-pay as lieutenants, before they have the opportunity of taking charge of a night-watch at sea.

Few naval officers are practically acquainted with the pilotage of our home coasts (especially the east coast), or of the coasts and military harbours immediately opposite.

Another examination might be introduced which lieutenants should be required to pass in order to qualify for promotion to the rank of commander.

The subjects might be Tactics, Pilotage, International and Court-martial Law, Meteorology, Economy of Fuel, and the Usages of War.

As regards seamen, up to December, 1875—

The course of instruction in the training ships for boys is supposed to last from one to two years, and includes gunnery, squad, rifle, and company drill, boating, working in rope, and drill aloft. The time for instruction is shortened by attendance at school and leave.

No doubt the boys learn a great deal—it is wonderful how so much can be crammed into their heads in so short a time—but, unfortunately, they forget what they have learnt as fast as they picked it up, or faster. They leave the training ships (where they have been carefully looked after, and not been hard worked manually), in apparently good discipline, well-dressed, neat, and clean.

Some, after a passage in a troop or store ship, where they have to look after themselves, arrive on board their proper ship slovenly, dirty, and undisciplined. Many of them who join ironclads are put on the forecastle or quarter-deck, and for weeks or months go no higher than the top; and as the ship when at sea is generally under steam, even those stationed aloft get little real work.

Others go to the first reserve ships, where their chances of learning their duties as seamen are far less, the ships being seldom at sea. Others, again, go to small ships starting on long voyages to hot and enervating climates. All the instruction they get is the necessary work of the ship. They miss the good feeding of the training ship, and have not sufficient stamina to stand the incessant hard work of a small ship; this, together with sea-sickness, brings them to a low state of health, and they become an incumbrance rather than an assistance; it is also hard on the remainder of the ship's company.

In all these cases, the boys have forgotten much of what they had so imperfectly learnt, that instead of their instruction in a sea-going ship commencing where they left off in the training ship, they have not only to be re-instructed, but the instructors have to eradicate many loose and careless habits of drill, which have been passed over in the training ships, not through the neglect of the instructors there,

but as the natural result of the high pressure required to pass the boys through the mill in such a short time.

Another evil is—

The boys being rated ordinary seamen 1st or 2nd Class at 18, or, at the latest, 18½, enjoy the same privileges as the men (for the young ordinary seamen cannot be called men) as regards general and night leave.

Many of them pass a considerable time waiting in the depôt ships at the home ports, and naturally avail themselves of every opportunity of going ashore. Their pay is not sufficient to meet the expense of this; and, as Captain FitzRoy observes, they borrow money at great usury from the "Lower Deck Bankers," and, in many cases, become so hopelessly involved, that they desert.

When on night-leave, they have to choose between hiring a waterman to take them off to their ship, or paying for a bed in a (perhaps dirty and uncomfortable) lodging-house.

In the morning they have a drink before coming off, which renders them stupid at drill and insubordinate. The age at which they are rated, and the following two or three years, is the time when they are by nature most troublesome and insubordinate; it is, therefore, the age when discipline must be most stringently enforced.

The able seamen are affected by the want of having been systematically and carefully trained as boys and ordinary seamen.

In working aloft, they are careless and slovenly in small details.

At gun-drill, they will slur over the important details of sponging, loading, adjusting sights and scales correctly, and they will fire when the sights are not on.

They perform their rifle and cutlass exercise in an equally careless manner, ignoring the instructions laid down in the drill books.

They are careless in their dress, and putting on their belts.

In fact they clearly show want of discipline, resulting from inattention to small details.

A conclusive proof of this is their general neglect, when on shore, of saluting military and even their own officers in passing; in some cases they do not even get out of an officer's way.

In speaking of slackness at drill and slovenliness in dress, the seamen gunners are not included.

The petty officers are slow to assume their proper position and assert their authority, but they are gradually improving in this respect.

The proportion of petty officers and leading seamen to the remainder of the ship's company is excessive, and works against the petty officers taking a proper position; but where strict discipline is maintained, the petty officer is able to take charge equally as well as the non-commissioned officer in the Marines or the Army, and blue-jackets make as efficient sentries as can be found in any other force, without suffering any deterioriation, as I can see; on the contrary, they are improved by occasionally doing sentry.

Barracks for seamen, on the same principle as the Marine Divisional Barracks, with mastless ironclads, a masted frigate, brigs, gun and

torpedo boats, and an armoured steam target-ship attached, also sea-going sailing training frigates, are absolutely necessary to raise the Navy to its proper standard and maintain its efficiency.

A great deal of a seaman's duty can be learnt in barracks and the neighbouring harbours and coast, with the assistance of the ships and boats above mentioned, better than on board an ordinary man-of-war.

For instance—

Elementary gunnery and eye-training.

Rigging and stripping ship; elementary sail and spar drill.

Squad, company, musketry, rifle, cutlass, and pistol drills.

(The military drills should be taught by Marine officer and non-commissioned officer instructors, and the stokers should go through a course of disciplinary drill.)

Boating.

The tidal creeks and sandy beaches in the harbour would furnish good practice places for landing and embarking troops, horses, guns, and stores, buoying channels, anchor and torpedo work.

Firing fron the boats and gunboats under the same conditions as would obtain in actual warfare.

The officers would benefit by the opportunities—

Of handling and navigating the brigs, gun and torpedo boats;

Of manœuvring at shot and torpedo practice against the moving target ship;

Of gaining experience in the conduct of landing parties;

And of observing the position of the forts with regard to the pilotage of the place, and the best plan of attacking them, or of acting in combination with the shore batteries and torpedo system for the defence of the harbour.

The Gunnery and Torpedo Schools would be absorbed in the Barrack system.

The mastless ironclads, gun and torpedo-boats, would form part of the national defence. They would be always ready for service, and would be utilised for training the Marines as well as the seamen. (While suggesting to place the military drill of the seamen under Marine officer instructors, it would be advisable to place all but the elementary and shore-going gunnery of the Royal Marine Artillery and Light Infantry under naval gunnery officers and instructors.) It is to be regretted that the gun drill of the Royal Artillery and of the Navy are not similar.

All troops, Marines or not, should, when stationed in naval ports, be exercised in embarking and landing from boats and alongside jetties.

The gunboats might be periodically concentrated for the practice of naval tactics, and should visit the small ports to train the reserves, and to practise the officers in pilotage.

Money prizes should be given for pistol-firing, loose play with single-stick, and spring bayonet; and for boat-racing, on the same principle as the gunnery and rifle prize-firing, the winners wearing badges.

As regards sea-going sailing ships for training purposes, it is impossible to make sailors, except by actual practice at sea, in all weathers.

The masted ironclads are seldom at sea under sail. Ships on foreign stations are often kept long periods in harbour for political reasons, and in many cases the climate is unsuitable for drill. The younger men in these ships have, therefore, little opportunity of learning their duty, and are consequently inferior as seamen.

The usual competitive drill of squadrons does not teach the backward men so well as progressive instructional drill in slow time, the reasons for every step being explained, and correct performance of every detail being insisted on.

The sailing ships for training purposes should be frigates, with the proper proportion of officers and petty officers, in order that strict naval discipline and regular man-of-war routine may be maintained.

Being without engines, the expense would be lessened, and more experience would be gained in their handling than in steamers. They should have plenty of practice in going in and out of harbour for the purpose of instructing the officers in pilotage, and in the capabilities of a ship under sail.

Their cruising ground should be in the Atlantic and round our home coasts, avoiding unhealthy places, and not too far to enable them to be quickly recalled in case of war.

Towards the end of their cruise, they should assemble to practise the officers in station-keeping, and the crews at competitive drill.

They should be sufficiently numerous to allow one or two to be detailed for cadets, others for the ordinary seamen, and others, again, to receive the best of the boys from the mercantile training ships at home or in the colonies.

The system might be further extended to foreign stations.

Midshipmen should pass through a long course in the training ship at sea before joining the general service, and should learn their military drills in barracks.

Boys on entering the harbour training ships should first be put through a strict course of squad drill without arms, to ensure discipline and order.

The course would then consist of—

Elementary seamanship (especial care being taken to ensure activity and confidence aloft).

Elementary gunnery (with eye training, which cannot commence too early).

Boating.

Gymnastics (including cutlass exercises).

About eighteen, after a second medical examination to weed out those unfit, they should be sent to a sea-going training frigate, for an advanced and progressive course of instruction in the same subjects.

After a course of about one year in the sea-going training ship they would be sent to barracks to qualify in their military drills, and would probably be fit for drafting in six months.

Ordinary seamen until the age of twenty-two or twenty-three should be under exceptionally strict discipline.

Able seamen should receive an increase to their present pay, and those who have qualified for the position of petty officer, should receive

a further increase of pay and privileges, but should only become petty officers as vacancies occurred, or in case of expanding the Navy in war-time.

When men are sent to prison they forget their drills, and their services are entirely lost for the time. If barracks were established, men undergoing imprisonment in cells attached could be drilled instead of picking oakum; there would also be no chance of their being contaminated by prisoners who have committed other than military offences, and they would be saved the disgrace of being confined in a common prison.

As offences are sometimes committed for the express purpose of obtaining discharge, men discharged from the service as objectionable either without or after imprisonment should be placed under the surveillance of the police in the district where they reside, reporting themselves periodically.

In many cases stoppage or reduction of pay and time during bad conduct, without imprisonment, might be introduced as a punishment with advantage, especially in unhealthy climates, at places where the prison discipline is known to be slack, or where there is a likelihood of the men having to mix with criminals; by this means the services of the man would be retained, he would be kept up to his drill and stations, he would be a constant warning to the ship's company, instead of returning from a slack prison and saying that it was comfortable, as is sometimes the case; the expense, also, would be reduced.

As the principle of stoppage of pay and time for bad conduct is already acted upon in the Navy, necessarily in cases of imprisonment and breaking leave, and optionally when confinement in cells is awarded, it might well be extended.

In small ships where there are no cells, and lying, perhaps, at a place far from any suitable prison, it is in many cases impossible to award an adequate punishment for grave offences.

The case of war time must also be considered.

It would probably conduce to the good discipline of the service if chief and other petty officers of the military branch were placed on an equal footing with those of the civil branch as regards uniform; and to the comfort of the men if the useless and expensive blue jacket and the black hat were abolished; it would also give them more stowage room.

The drill and discipline of the Marines is well known to be admirable. They get hardly any military training while embarked, and even that is for practice, not for instruction, yet they are always efficient; this shows that they have been trained on a sound principle, and that great care and attention are bestowed in barracks, to ensure accuracy even in the smallest details. This is a striking contrast to the military drill of the seamen, who (with the exception of the seaman-gunners) seem to be always at drill, and yet never seem to reach a satisfactory standard.

The Marines are especially valuable from being, as a rule, strong, able-bodied men; whereas many of the trained boys grow up very inferior in physique, their training has been too expensive to permit of their being weeded out. This will be of grave importance in war

time, when continued heavy work has to be done, especially where the complement is small. In small vessels all the boats cannot be manned without stationing Marines at some of the oars, and after a little practice they pull good strong oars, and are quite at home in the boat.

The Marines, as a body, are not quite so active as is desirable. It may be said that any attempt to improve them in this respect would diminish their steadiness, but there are a great many very active and handy men amongst the Marines, and it is a fact that these men are the smartest soldiers in the corps.

Boating, with the exception of hoisting and lowering at sea, can be as well taught in the neighbourhood of the harbour, close to the barracks (of seamen and marines) as anywhere. Boating, firing at a mark with rifles from boats, and the practice of embarking and disembarking quickly and quietly under various circumstances, should form part of the barrack instruction, which should also include a thorough and continued course of gymnastics, the practical working of guns as mounted in various mastless ironclads, firing at a target in a sea-way (from gunboats attached) including careful training in the precautions necessary to prevent the gun taking charge, also the ordinary knots and hitches used at sea (already taught in the Royal Marine Artillery).

It is impossible to have efficient marines without sending them to sea, but it is not necessary, or even desirable, to keep them at sea for long periods, the object should be to pass as many of the men as possible through a sufficiently long course of service on board ship to enable them to learn their duties thoroughly, and then to disembark them to make room for others. So, that while having a large Marine Corps, they would be *bonâ fide* marines.

A great deal of the popularity of the corps depends, however, on the fact that a marine, while embarked, is provided with free rations, he has many opportunities of saving, and also of earning money as a servant, or working at his trade. It is probable that in future some of our coaling stations, as Hong Kong, Falkland Islands, Vancouver's Island, &c., will be garrisoned to a great extent, if not entirely, by marines, as recommended by Captain Colomb, Royal Marine Artillery; these men should receive free rations as when afloat. Captain J. C. Wilson has most forcibly represented the undue proportion of the "non-"combatant," or, rather untrained element in our ships' companies. This may be remedied to a great extent by the employment of marines to fill many of the ratings now held by untrained men; this would increase the number of prizes in the marine service, and make it even more popular than it is.

At present many of the marine servants are unfitted for their position, and have, perhaps, been told off as servants to get rid of them from the ranks. A better plan, and one more to the interest of the corps, would be to select from amongst the smartest, cleanest, and most sober men who have finished their course of training, and who are the least likely to forget what they have learnt, a certain number, who should be carefully trained as officers' servants and cooks, from whom officers applying for their services would be supplied.

Others should be trained for the following ratings:—

Writers	(non-commissioned officer and private).	
Ship's cook and mate	„	„
Blacksmith and crew	„	„
Armourer and crew	„	„ (Royal Marine Artillery.)
Plumber and crew	„	„
Painter and crew	„	„
Cooper and crew	„	„
Band-master (?) and band	„	„
Musician	(private.)	
Sailor	„	
Shoemaker	„	
Barber	„	
Butcher	„	
Lamp-trimmer	„	

Nearly all these men could make a little money from private jobs—servants and cooks would get private pay in addition to their service wages—a small addition to the pay of some of the ratings would be necessary. Many men would join the corps with the express intention of obtaining these ratings.

Any officer who has been stationed in charge of the flats of an iron-clad, at general or fire quarters, must have felt the difficulty of getting the work done properly by the mixed crowd under his orders, especially when several of them are foreigners.

The employment of foreigners, or even British subjects, who can neither talk or understand English, is not only inconvenient, but dangerous; and the number of untrained men seriously cripples the efficiency of all ships, especially small ones.

It is only required to see a ship, with all her boats away manned and armed, try to work a few guns (to cover her boats) with the remaining hands, to be convinced of the extent of the evil.

With the exception of their want of military training, however, there is no reason to complain of the efficiency of the present artificers.

Rifle fire will be more valuable than ever, for the purpose of picking off the officers of an enemy's ship, or forcing them to keep under cover, for firing through his ports, and resisting torpedo attack. In many ships the small-arm party at general quarters is not sufficiently numerous.

Nothing that the Navy can do on the sea or in defending the coast can justify the absence of an efficient field army to meet the enemy in case of a successful landing.

Gymnastics and military drill should be compulsory in all schools; but if not carried on under strict discipline, it will be worse than useless.

No person should be appointed to a public office who does not hold a certificate of efficiency in elementary military drill and the use of the rifle, from a competent military authority.

It is absolutely necessary that definite martial law should be laid down as regards the discipline of volunteers in war time.

GREAT BRITAIN'S MARITIME POWER, HOW BEST DEVELOPED, &c.

By Lieut. SYDNEY M. EARDLEY-WILMOT, R.N.

"Magna pericla latent."

Introduction.

THE subject of the present essay is, perhaps, the most important as affecting the welfare of this country that could be brought forward now or at any future time. But it would seem to be especially applicable at the present moment, when disquieting rumours are rife. And in observing the great changes that have taken place since Great Britain last exercised maritime power, not only have the instruments of force themselves undergone transformation, but the conditions have so altered under which maritime warfare is carried on, that it behoves us to consider whether our maritime power is likely, or not, to suffer by those innovations from ancient principles which enabled us to acquire that naval supremacy conceded by the world, and which we should at all hazards retain.

In fact, a brief review of this portion of our subject is necessary before entering into the several units of which the whole question is composed, for in treating of most it will be found to have an intimate bearing upon the point under consideration. In what, then, consists maritime power? A brief and concise answer could be given by quoting the four heads upon which we are asked to dilate in this essay. But it is possible that this power may in some measure be weakened for the following reasons:—

1st. If the fighting ships of one nation greatly preponderate over those of another, as was the case in the Franco-German war, when the French Fleet hovered vainly about the German coast, while the enemy remained snugly in port. There was not even a blockade, for at night the French went out to sea for fear of torpedo boats.

2nd. The protection of commerce would appear to have lost much of its importance under the new principle that the neutral flag covers enemy's goods, with the exception of contraband of war.

3rd. The value of a supplemental force is weakened for the same reason, and also from the concession which precludes us from utilising the assistance that private vessels could afford in time of war.

4th. Colonial and home defence is affected to a certain extent by the same conditions, for the number of our Colonies is such that we should look to them to contribute in a measure to their own defence, and it is obvious that to take away from them the right to equip supplemental vessels would be neither politic nor just.

It would be as well, therefore, to give a few reasons why we should not limit our means to carry on, when required, the most efficient warfare, whether for offensive or defensive purposes, nor do I think it can be considered foreign to our subject.

Nobody will deny that on the maritime power of Great Britain mainly depends the safety of the country, and this has been proved on more than one occasion. Neither can it be viewed solely as a defensive arm, for without its aid no offensive measures can be carried out; a fact equally indisputable.

Its functions in peace time are almost as important, for they extend to all seas and to all countries. But as under the present condition of that system by which nations seek to obtain justice, real or imaginary, from each other, all should be prepared for war, it is necessary to consider that view, especially in the development of our naval strength.

It is useless to ignore the fact that wars, though not so frequent now as heretofore, do take place; and however sad it may be to contemplate one nation engaged in strife with another, certain it is that the evil is not unalloyed with good, and we may be sure that in the civilisation of the world, war has been an important factor.

Recognising its existence, then, and till some other method of settling international disputes has become universal, it stands to reason that our policy should be to make this as effectual as possible. The primary object of war is to reduce an enemy to submission; and though there are certain limits to the means employed, they have generally only extended to that portion of the community which, among all civilised nations, has an admitted claim to humanity. If warfare is to be restricted to a section of the community, we not only prolong the operation, but also take away from some nations their chief power, so that it is difficult to realise their voluntarily submitting to such regulations. For instance, Great Britain, from reasons that all admit, cannot have a large standing army, for the system by which they are obtained on the Continent is foreign to all our national ideas. But from the earliest period of our history, this country has been essentially maritime. Inherent to us is a proclivity for the sea, resulting chiefly from our being an island, which has given us the largest sea-faring population in the world, so that to this arm we have always looked to counterbalance the want of military strength. Our object, then, in war should be to utilise this power to the fullest extent by inflicting with it as much injury to the enemy as possible. The question then arises, how is this best effected?

I think that an examination of certain facts will show that, to cripple the commercial intercourse of a hostile power will conduce

largely to that result. Nations attain their power chiefly through commerce. It not only gives them the sinews of war, but under adversity enables them rapidly to recover strength. No more notable instance of this, than that of France after her late war, has occurred in modern times, whereas had Germany been able to cripple her commerce, the financial state of the former afterwards, would have been far different. Germany has seen her mistake, and since that time has laid the foundation of a powerful maritime force.

But it has been argued that England, herself possessing such a vast commerce, must needs be the chief sufferer in such an eventuality. Granted, were our protective power not in equal ratio. But it must be allowed that the loss of a small portion would not be felt, while with another Power, a similar amount would seriously cripple her resources. Let us, on the other hand, observe the effect produced by allowing commerce to pass free under a neutral flag. Take the case of a great military Power, having little or no naval strength, at war with a nation strong at sea but weak on land. The former simply puts all his commerce in neutral ships, and uses his military strength to the greatest advantage. The latter, finding his vocation gone, would have to content himself with a policy of masterly inactivity, and be reduced to using his great source of power as a means of defence only. Who would blame him, however, when existence was at stake, for breaking through those restrictions; for self-preservation is the first law of nature? Again, why should there be such a dislike to the principle of privateering among Continental nations, while, on the other hand, we find the United States and this country desiring to retain it? Simply because both know they are peculiarly adapted to employ such a weapon with effect, and it enables them to utilise the patriotism of all who cannot otherwise assist. Those nations, however, who have advocated the abolition of privateers, would find it a matter of considerable difficulty to supplement their regular strength by such auxiliaries. Hence their opposition!

In England, however, there exists great misapprehension on the subject of private vessels fitted out for service against the enemy. Their use is associated with irregularities and cruelty. They are accounted the Bashi Bazouks of maritime warfare. But, as we may put aside many of the reports concerning the cruelty of the latter as unfounded, so we have reason to know that the proceedings of privateers have certainly not been accompanied by extraneous deeds of cruelty.

We may ask, moreover, what would be the *status* of a vessel fitted out in the Colonies, and manned by a crew unconnected with the Navy? To all intents and purposes she would be a privateer; but could we debar Australia or any other distant possession from taking into their own hands defensive measures in order to supplement our regular force? Assuredly not; so we must recognise in a measure private efforts; and if the seizure of property is not quite so honourable as sending a vessel to the bottom with a torpedo, it must be conceded that the operation is less cruel.

Before leaving this subject, let us not forget that we have a large number of merchant steamers, many steam yachts, and other private

vessels, which are available for defence if not for offence; that among the gentry are many of wealth and patriotism sufficient to fit out a vessel to act in any way required; that in the regular Navy we have not sufficient officers and men to man more than a few of such auxiliary vessels, and our reserves would be all required for other purposes. Therefore, I do not think that on an emergency we should scruple to avail ourselves of such outside assistance; and if we do not, except in time of need, it would be as well to retain the power. I am of an opinion that recent events have tended to revive this feeling throughout Europe, and a few months may see a great change in this respect. With these few preliminary remarks, I will pass on to the several heads of the present essay, and at once come to—

Fighting Ships.

Now I must confess that this point has caused me great perplexity, for so many definitions have been given of what should constitute a fighting ship, and our own Navy presents such a diversity of types, that one may well pause before venturing to add to the varieties, by advocating something different even to all. It is, however, in the disagreement of so many able men that courage is found to suggest certain alterations, more in detail than general principle, for no professional man can dispute that the majority of our ships fulfil most of the conditions necessary for an efficient fighting man-of-war. It has been my lot to visit many foreign vessels, and to form a fair opinion as to their capabilities, but, have never returned to a comparison with our own, without finding cause for satisfaction. Therefore it has always seemed to me manifestly unfair only to point out, as some seem to take a delight in doing, the defects of vessels constructed at a time when the world was ignorant as to how far iron would be needed in ship-building, for none could then foretell the advance guns would make, even as it would be impossible to say that we have now reached the limiting size of them for use on board ship. Our ideas, therefore, as to the best type of fighting ship have altered materially from time to time, and must continue to sustain modification as we develop new schemes of destruction; and I am inclined to believe we have yet to construct a vessel which shall combine in a greater degree those conditions that the most experienced and ablest naval men consider indispensable. One conclusion seems certain, that as with all concerns in this world, we can only approach perfection through a compromise, and that those matters which are deemed essential to the welfare of mankind are nothing more or less; so we must be satisfied with a ship that cannot be otherwise than a compromise.

The point of disagreement is in what manner it shall be attained. We cannot combine in a perfect manner, speed, turning power, heavy armament, complete armour protection, ability to keep the sea for a lengthened period—all, in fact, of those attributes which divided opinion has deemed necessary; and the question is, what shall be abandoned and what retained? Now, as regards a fighting ship, I consider the following points essential:—

1st. Speed.

2nd. Handiness in turning.
3rd. Heavy armament.
4th. Armour protection for guns and vital parts.
5th. Stowage for fuel.
6th. To offer a small mark for artillery fire.
7th. To be built in numerous compartments.
8th. Moderate in cost.

We will take each of these points in order.

First, as regards speed. It must be acknowledged by every one that this is an important quality for a fighting ship, as without a certain speed a vessel is practically helpless. I would consider 14 knots the lowest rate, and with such a provision she could not find herself placed at a disadvantage, unless in comparison with some vessel in which speed had been the first and only desideratum.

Second, the turning power of ships, I consider of equal importance. Possessing great handiness in movement will enable a ship to manœuvre with facility, will conduce to her safety in ordinary navigation, and enable her to utilise the ram or avoid such an attack with greater certainty of success. Thus it is impossible to over-estimate the importance of this point, and to secure it, we should be prepared to sacrifice in other directions.

Third. Heavy armament.—Not a few are of an opinion that a number of moderate sized guns are superior to a less number of greater weight. This is perhaps on the assumption that a large percentage of shots will be thrown away in the heat of action; and no doubt where the fire is left in the hands of men whose vision is limited by the confines of a small port, and whose training, however good, has not led them to calculate how minute an error at the moment of firing will affect the result, we cannot hope to see every shot strike the object. But if, on the other hand, we concede that firing by broadside will in the future be the usual mode of procedure in a naval action against armoured vessels, we may expect that this defect will be greatly overcome. The employment of electricity also will decrease the percentage of waste shots immensely, because with it we obtain—

1. An instantaneous delivery of fire.
2. If guns are correctly laid, no shot is thrown away.
3. Direct communication between the guns and officers in command.

The first removes that necessary calculation of time that must be allowed in communicating the order to fire to the guns.

In the second we prevent any gun being fired prematurely, for none are placed in the electric circuit until accurately laid by the orders given.

In the third we do away with a great defect arising from intermediate orders that may be imperfectly understood, or erroneously communicated.

In fact, against an armoured ship, only broadside firing could be used with effect for several reasons, of which the following are a few:—

1. Because of the greater total effect of a number of projectiles

striking at the same instant, compared to a like number striking at intervals.

2. Because between decks, the enemy would be visible for such a brief period, owing to rapidity of movement.

3. Because smoke between decks would impede the vision.

4. Because the most advantageous bearing, and part to attack, must be decided by some one who has knowledge on that point.

5. Because opportunities for firing will only occur at intervals.

Therefore, I am of an opinion that the weight of a broadside, independent of the number of guns, is the chief point, and that the destruction caused by cannon is proportionate to weight and diameter of shot; also that a few heavy guns are preferable to a large number of lighter weight. I agree with Monsieur Duhamel, who says, "Il est certain que ce sont toujours les gros canons qui sont les plus "avantageux dans un combat, et ainsi il est préférable de mettre sur "un vaisseau un petit nombre de gros canons qu'un plus grand nombre "de petits."

Fourth. Armour protection for guns and vital parts.—I must confess that on this point my own opinion is at variance with a great number of distinguished Officers, whom I find advocating the total abolition of armour in the vicinity of the guns, in order that it may be put elsewhere. Now, it seems to me that, however grand may sound the theory of making a ship unsinkable, in practice it will be found impossible. Guns, rams, and torpedoes must always carry a margin of power over the defence of a ship which will prevent our making her unsinkable by means of armour-plating. Besides, consider what we risk by stripping the guns and crews of all protection. The terrible effects of shell fire are well known, and in a short time we might have every gun disabled and the crews decimated. But, say the advocates of this principle, then she can act as a ram. I think this is relying too much upon an auxiliary weapon, and three things are needed to use it efficiently—great speed, handiness in movement, and more than ordinary skill to bring it to a successful issue. A chance shot might create confusion and entail failure, and the frustrating efforts of the enemy must be taken into account.

A fair illustration of the advantages of armoured protection for guns as well of as a heavy armament, is found in the action of the "Shah" and "Huascar." The former, by superior gunnery, struck the latter frequently, but did no serious damage, because she had not sufficiently heavy guns to penetrate the armour. But if the "Huascar" had made similar shooting, it is fearful to think of the consequences to the "Shah's" unprotected sides. Fortunately she was not hulled by a single shot! One fact, however, is significant, that a small monitor with a Peruvian crew kept two English ships at bay for a considerable period, and eventually escaped!

But, again, it seems to me that an important point has been lost sight of in discussing this question, and it is that we can make a ship too unsinkable, if the paradox may be admitted. That may seem impossible to many, but my meaning is this, that if we take away all armour from guns and their crews, to place it about the water-line and

machinery, our ship may not be sunk by a heavy and well-directed fire, but her power of offence will be gone, and to avoid capture, we must either sink her ourselves or run.[1] With a change in the weapons of destruction has come a change in the principle of their use. Disabling with a view to submission was the former end of a naval action, now it seems we are not satisfied without annihilation. I think, therefore, the wisest course is to retain protection for guns and gunners, sufficient at least to keep out common shell, and not seek to make a vessel perfectly unsinkable, if it is a choice of robbing Peter to pay Paul.

Fifth. Stowage for fuel.—To obtain this, and for other reasons, it will be necessary to do away with masts, and at once I state my opinion, that under present circumstances for a purely fighting ship much is gained by their abolition. We have reduced the number, but we have yet to learn what sailing qualities will be exhibited by the "Temeraire" with her brig-rig. She is 282 feet long and 62 feet broad, which is in the proportion of nearly 4·5 to 1, and I think no other ship afloat has so small a ratio of length to breadth. Therefore great power will be required to propel her through the water, and her spread of canvas will not have much effect. Steaming, however, against a head-wind, her heavy spars will offer a great resistance, and if economy should be the only point, I am sure there would be a saving in the long run by having no masts. Another defect they involve, is sadly to circumscribe the all-round fire of the barbette guns, for the rigging on each side covers a large angle of training. That would have to be sacrificed in action. Masts, also, with the rigging, are liable to hamper the movements, and increase the size of mark offered to the enemy's fire.

As regards the actual quantity of coal carried, it will depend upon the size of ship; but there should be the ability, say, of steaming from England to Malta at a sustained speed of ten knots an hour. There are but few ships in the British Navy that can do this, and they probably are mastless.

Sixth. To offer a small mark for artillery fire.—It is hardly necessary to dilate upon the advantage of this, but all who have been at sea with a squadron composed of different types of ships cannot fail to have remarked how small a mark is presented by a low ship without masts, even when tolerably close, compared with the high freeboard-masted vessels. That always struck me last year when our squadron exercised at fleet evolutions during a seven months' stay in Besika Bay. Be it remembered also that a very small error in elevation will affect the result much more in the one case than in the other, and this point applies with greater force at night, when the loom of one would be insignificant compared to that of the other.

Seventh. To be built in numerous compartments.—A great authority has said, and experience has demonstrated, that "it is idle to attempt to "form the bottom of a ship strong enough to resist a fair blow from a "powerful torpedo. The extent that can be done is to keep the disabled "ship afloat after she has received such a blow." That could be effected under certain circumstances depending upon size of torpedo employed;

[1] Nearly all our naval victories have been won by disabling guns and gunners, and so placing the ship *hors de combat*.

but we may reasonably doubt the possibility of saving a ship under whose bottom, and directly beneath the machinery, a large mine had exploded. In dealing, however, with the smaller nature of locomotive torpedo it should be quite feasible to prevent total disablement by a judicious use of the cellular system, which prevails now in the construction of all our iron ships. The only question seems to be in the disposition of the compartments, and the difficulty of subdividing the space for machinery and boilers. With two sets of engines and boilers we may decrease the space, but the fewer doors the better, for with each comes a smaller margin of assurance that all are in working order. In fact, I would advocate having, as far as possible, the doors or openings above the water-line, which, if somewhat inconvenient, would tend to safety.

Last, but not least, comes the question of cost. Now it is evident that one ship will not make a fleet, however powerful she may be, and that, moreover, we cannot afford to spend a million upon a vessel that may be disabled by a single shot or torpedo. The estimated cost of engines and hull of the "Inflexible" is stated to be £521,750; so that by the time she is finally completed and fully equipped for sea, it is reasonable to suppose that nearly a million will have been expended upon her! For that sum we should be able to produce two, if not three, vessels which will together form a more powerful force, carry more chances of self-preservation, and would inevitably, if pitted against the larger vessel, sink her.

Having thus enumerated the points which we should endeavour to attain, I will strive to produce a ship that appears to me likely to combine them in the most advantageous manner. This ship should be somewhat similar to the "Ajax" and "Agamemnon," with certain alterations, but more approaching that type than any other vessel, either afloat or in course of construction. She should represent extreme breadth, compatible with speed and seaworthy qualities. A screw iron turret-ship armour-plated. Her length to be 250 feet, and extreme breadth 100 feet.[1] Passing over for the moment the question of speed, we shall here obtain most of the points already laid down as desirable. Undoubtedly such a vessel would possess wonderful handiness, with ability to turn in a very small circle. The increased breadth would allow heavy guns and armour to be carried with a comparatively small draught of water. She should have no masts, but all possible space utilised for fuel. In lieu of placing the turrets forward and aft as in the "Devastation," or in echelon as in the "Inflexible," I would place one on each beam, by which arrangement it follows that the best fighting position is end-on, whereby we utilise our offensive powers to the greatest advantage, but show the smallest point to the enemy. In this position, the ram can be used or avoided with facility; the Whitehead torpedo would have less chance of hitting; bow and stern fire are equal. Should an enemy deliver his broadside when abeam, one turret is protected by the other, and therefore the size of target is decreased. Although the breadth is so great, few shots can take effect from ahead

[1] These figures are not meant to be perfectly arbitrary, as a better result might be obtained by such a ratio as 270 : 90, though some advantages would be reduced.

because they will strike either bow at such an angle that they will not bite, for we know the limiting angle is about 35°. The same applies to the turrets, which must be struck fair to sustain damage. To counterbalance these advantages it must not be forgotten that a plunging or vertical fire would have more effect upon such a vessel, and that docking difficulties would present themselves; but it seems to me that the advantages are so great in comparison, that they outweigh the objections.

The question now remains, can we obtain with such a type the speed considered indispensable? I am of opinion that this is quite possible, for, first of all, let us consider upon what depends the speed of ships, or rather what tends to retard the forward motion. We may say generally, without going deeply into the question, that the total resistance to vessels passing through the water is made up of two constituents, one caused by the pressure exerted by the water against the ship, and the other due to the friction of the water on the sides and bottom of the ship. As regards the first, water being practically incompressible, what the ship displaces must find an escape, and the direction of the surface offering least resistance, it will take that route and so cause a wave or elevation at the bow which increases the resistance. This displaced water, however, will travel towards the stern, filling up the hollow left by the vessel, and assisting to propel her forward. It is clear then that the broader a vessel is, the more water must be displaced to allow her to pass, and therefore greater force is required to propel her forward. How then can we obtain this increased force or power? I do not myself see any other method than by increasing the number of propellers. Two things limit the power we can put into a ship, viz., weight and size of propeller. We have doubled the original number with satisfactory results, for the advantages of two screws over a single one are now conceded by all, and similarly a three or four-bladed screw gives greater speed than one with two blades. It It seems to me feasible to further increase the number of propellers, and instead of one, say of ten feet diameter, requiring 2,000 horse-power, by having *four* of the same diameter we could utilise 8,000 horse-power. I have read some remarks by Mr. Griffiths which seem to me worthy of consideration. He states that by placing the screws in tunnels and taking the water from underneath instead of from the stern of the ship, he obtained the same speed from a model 3 ft. 2 in. long and 1 ft. 2 in. broad as he did from one 5 ft. long and $7\frac{1}{2}$ in. broad.

In this case, form-resistance has been reduced to a minimum, and it would be worth while to extend these experiments. As regards the locality of additional propellers, I do not see why, with the type of ship here brought forward, we could not have two at each end as, I think, has been advocated by Mr. Griffiths for the following reason: that the action of the screw at the stern must tend to retard the vessel by acting on the water coming from forward, which instead of being allowed to propel the ship forward is thrust violently back, whereas could the action take place forward water would be taken from the place required and then sent back to fill the vacuity or be utilised by

other propellers. If this reasoning be correct, screws before the beam would give a better result than when placed abaft, and if combined, we should obtain a marked difference in speed.

Next, as regards friction of water on sides and bottoms of vessels, and this, I believe, is the cause of the greatest retardation of ships. Therefore any expedient for diminishing resistance in this respect will be followed by an increased speed. It is, however, extremely difficult to make the bottom of any vessel perfectly smooth; so many considerations come into play. Some surfaces are, of course, smoother than others, therefore less friction is produced, and consequently less resistance. But this friction is not a constant quantity because it increases with the speed. I believe Beaufoy found by experiment with planks that the friction per square foot was at one nautical mile per hour ·014 lbs., at two ·0472 lbs., at three ·0948 lbs., at four ·153 lbs., and at eight ·5008 lbs. Therefore it is evident that if the friction can be reduced, a considerable gain in speed will follow. I would suggest that experiments should be made with glass to ascertain whether it cannot be utilised for coating ships bottoms, either by plates or a kind of veneer of that material, which would enormously reduce skin friction and that fouling which is now so prevalent. Glass plates can be made of any shape, but some difficulty might be encountered in the glass and iron having different co-efficients of expansion. The co-efficient of superficial expansion of glass for 1° between 0° and 100° centigrade is ·000017226, that of wrought iron is ·000024408. I am not in a position to state whether glass would have sufficient elasticity to nullify this difference, but should imagine so, unless subjected to the extremes of heat and cold. With glass, no chemical action could take place for we put a non-conductor in contact with the iron; moreover, any deposit could be readily removed. I am not aware whether any experiments have been made in this direction, but could this material be successfully employed, a marked difference in speed would, I am sure, be observed.

In advocating a special type of vessel as best adapted for fighting purposes, I do not mean to preclude all others, because it is evident we must have different natures, according to the part of the world in which they may be needed. I would retain the above particular class for the Mediterranean and Channel, while, for distant seas, such vessels as the "Hercules" and "Triumph" are admirably adapted to sustain the national credit against any enemy they may there encounter. But I cannot admit any unarmoured vessel to be an efficient fighting ship, even if carrying heavy guns, for she may be crippled or disabled by well-directed fire from moderate-sized guns. The advantage of plating was shown in the action between the "Shah" and "Huascar," and remains to us a lesson not lightly to be forgotten. Unarmoured vessels are adapted for the protection of commerce and for the occasions of peace in showing the flag in all parts of the world. Let us not imagine, however, that they can engage successfully any ironclad which should be handled and fought with but a small degree of skill and courage, for if so, we may encounter chagrin and surprise in finding that our naval supremacy is not equal to the occasion. The hull of the "Shannon" may be unsinkable, but I firmly believe, with

a worthy antagonist, she would in a short time have most of her guns disabled and the majority of their crew *hors de combat*. It is hardly necessary to state that her guns on the upper deck are entirely unprotected, and that such a weapon as the Gatling gun, or even ordinary small arms, would have a definite work to perform, which would be to decimate the gunners. Another point which struck me as a defect in this ship is common to most of our vessels, and that is the position of the conning-tower. In the "Shannon" it is just abaft the foremast, which cuts off, therefore, the most important look-out of all, that of right ahead; whereas, if placed on one side, a less important bearing would have been obscured. It has always seemed to me best to have a single-armoured conning-tower in a commanding position rather than two rifle-proof sentry-boxes, one on each side. In action, the captain should take a certain locality and adhere to it; he cannot be dodging about from one side to the other. His eye should never leave the enemy, and at hand, should be communication with helm, engines, and guns. No worse place for a single tower can be than that amidships, unless before everything; and I have heard captains remark they would not think of boxing themselves up there, but would take to the bridge, building themselves a protection of hammocks against small-arm fire, in order to obtain a good all-round view. There seems to be an impression that a shot would strike the tower more readily than any other place, and that moving about carries with it a certain amount of protection. But such an idea is as absurd as that by moving in a shower of rain you may in a measure elude the drops.

This part of the subject would not be complete without a few words regarding the ram as a weapon, and also torpedoes. Respecting the latter, it is first necessary to put aside all feeling of sentiment as to their use, because all nations have adopted them. It is a more economical method of protecting coasts than with a large fleet, and helps to counterbalance any predominance of power one nation may have over another at sea. Skilfully-handled torpedoes are effective weapons, and for defensive purposes superior, under certain conditions, to all others. They may be defined generally as any mass of explosive material exploded under water, but they vary greatly in construction and operation. The Whitehead, as an offensive torpedo, stands above all others for several reasons, among which are:—

1. Its range of usefulness is great in comparison.
2. It has locomotion in itself.
3. Rapidity of movement.
4. Ability to retain a uniform depth and direction.
5. Its approach is unheralded by outward signs.

Under such circumstances, it simply takes the form of a submarine gun, with a shorter range of efficiency than the ordinary gun, but with the power, if successfully applied, of doing infinitely more damage. I would not, therefore, advocate the abolition of ships carrying guns for a fleet of torpedo-boats armed with this special weapon, but that the two should act in combination. Every large

ship should carry this weapon, and a boat sufficiently large to be employed on torpedo-service, having a fair speed and seaworthy qualities. An increase in the size of the ordinary ship's launch would secure this. In action upon the open sea any opportunity of firing the Whitehead torpedo should be seized, but it must be remembered that various causes will co-operate to limit its chance of success except at close ranges.

As for the reasons laid down, I would not give torpedoes undue pre-eminence over guns, so also I would not consider it desirable to build vessels for ramming alone. The ram is an important weapon within the limits of its range, but many conditions come into play before its successful operation can be assured. Such would need, in a vessel attempting ramming only—

1. Great speed.
2. Handiness in movement.
3. Skill and nerve of a high order.
4. Incapacity on the part of the enemy.

Furthermore, the effect of a blow from a ram will be less than of a torpedo explosion, and I am inclined to believe the idea of the former is much exaggerated. It is probable that an efficient water-tight compartment system will prevent any ship being sunk in this manner. In concluding this part of the subject I would state, then, my opinion that the maritime power of Great Britain would be best developed, as regards fighting-ships:—

1st. By having a certain number of iron or steel turret-ships, armour-plated, of a length about 250 feet, and extreme breadth about 100 feet.

2. That they must be capable of a speed of 14 knots per hour, to be attained by increasing the number of propellers, and by reducing the friction on the bottom by introducing a smoother surface.

3. That they shall carry a turret on each beam, thus having a perfect bow and stern fire.

4. That they shall be mastless.

This type to be for service in the Channel and Mediterranean.

For service in distant parts, fighting vessels should be masted ironclads, with a fair sailing capacity, carrying heavy guns, protected by armour sufficient to keep out common shell, and having an armoured belt right round at the water-line. Such vessels as the "Hercules" and "Triumph" correspond to this description, and are well adapted for any part of the world. I would here point out the necessity for such a vessel on a station like the Pacific, having spent three years there in an ironclad, and travelled during that period 30,000 miles under sail alone. The average expenditure of coal was only 1,600 tons per annnm, and yet all the functions of a British man-of-war on a foreign station were efficiently performed. What the result would have been had such a vessel met the "Huascar" must be left to conjecture.

I shall now pass on to the next portion of this essay, which deals with the protection of commerce.

Protection of Commerce.

It is hardly necessary here to point out the direct bearing commerce has upon modern warfare. It simply represents national wealth, strength, and rapid recovery from disaster. To supply other nations with those articles not to be obtained in their own country, and receive from them what does not abound or exist in our own, has formed that large commercial marine which has produced the vast wealth of this country. All nations are rich or otherwise by the measurement of their commerce, and true power consists not in men numerically, but in money and national credit. Many causes have conduced to give Great Britain a greater commerce than any other nation. Her natural resources are superior; that is to say, in this country more useful substances are to be found than in any other; so the world comes to us to buy. Possessing the materials and skilled labour, we can build better and cheaper vessels to transport them. We find, consequently, not only British vessels carrying our articles of commerce, but also those of every other nation. The most important item that we receive from abroad is that of food. The amount of grain and meat produced in this country is insufficient for our numbers, so we are largely dependent upon a foreign market. Our supply, however, could never be stopped by a war with any one country unless we lost command of the seas, for abundance could be obtained from other parts. An adequate protection for our commerce, then, is an absolute necessity, and, if that be granted, it follows that we shall derive great advantage by impeding that of any nation with whom we are at war, instead of allowing them to increase their wealth, and so prolong the struggle. At present we are in a state of uncertainty as to what constitutes contraband of war, but lately I have heard it broadly defined as anything which may assist a nation in warfare. Food is certainly an important item, while coal is often a more useful auxiliary than gunpowder. An impression seems growing that the time has arrived to consider everything contraband that belongs to an enemy; this, at any rate, would prevent confusion now, and hereafter perhaps disastrous arbitration. We have nothing to fear from such a step, for England possesses such a reserve of power and vitality in a maritime aspect, that only an impossible combination could stop our vessels from carrying our trade to all parts of the world.

In treating of vessels of war for the protection of our commerce it is difficult to determine whether to look at the question purely from that point of view or as to what type is best adapted for various purposes, of which the protection of commerce is but one. There has been a tendency to imagine a vessel can combine every attribute, and disappointment has resulted from the failure of a ship of considerable pretension to successfully compete with another which was not intended for a like purpose. Under no circumstances could the "Shah" be considered a fighting ship of either the first or second class; and then we come to the question as to whether she is the best type for a cruiser. Now I am of opinion that unarmoured vessels do form an essential part of our maritime strength, and that we may with

advantage increase their number. Their functions should be to protect our commerce in time of war and to destroy that of the enemy. In time of peace they would constitute our training establishments, and be distributed over the different stations. To efficiently carry out such a purpose we require a large number, and in time of war we should have to supplement them by utilizing merchant steamers that could be most readily adapted to carry two or three guns and the Whitehead torpedo.

For an ordinary cruiser we require—

1. Speed.
2. Moderate size.
3. Coal carrying capacity.
4. Moderation in cost.
5. Ability to carry one or two heavy guns.

The only question in my mind is where to draw the line as to size; whether to take such a vessel as the "Iris," which will possess most of the qualifications laid down as the standard, or a smaller type. My opinion inclines to the latter in view of the numbers required, and under the impression that in the event of war with certain Powers, a great number of small ships would be hastily equipped and sent out to prey upon our commerce. We have seen the damage one "Alabama" could inflict, and it is against a similar type I would chiefly provide. I should advocate for this purpose vessels about 200 feet long and 35 feet beam, of about 1,800 tons burden, and 3,000 horse power. They should be built of steel, and have a mixed armament of light and heavy guns. Their spars should be light, and spread of canvas in proportion. There is no occasion in these days for a ship to be a fast sailer. Sail-power is only used for economy and training purposes. All we require is an auxiliary to assist us from port to port in peace-time. In war-time, however, steam would always be up, and heavy spars would then be only an incumbrance. Steel has several advantages over iron for such a ship, being lightest for an equal strength, and the skin friction should be less, owing to its smoother surface. These vessels should carry the Whitehead torpedo, which, under certain circumstances, can be employed with terrible effect, especially by any ship commanding great speed. Fifteen and a-half knots should be realized by this type, which is sufficient for a crusier; nor do I think there would be difficulty in obtaining this speed. The draught of water should be about 16 feet forward, and 19 feet aft, and I would sacrifice no advantage in steam power to obtain additional sailing capacity. If twin screws will give an increased speed, have them, and relinquish the idea of hoisting your screw. Steam is now the motive power, and until it is superseded by another, everything should be subordinate to it. Perhaps the chief advantage of the type here advocated for the protection of commerce would be in economy, for roughly speaking they would cost half the price of the "Iris," and at the same time possess most of her qualifications. By the diminished length we should lose slightly in speed and stowage, but I think we gain in comparison. Much has been spoken and written about belted cruisers, but I have never yet been able to determine whether

they are to be considered as fighting ships or simply cruisers. The only one I have had an opportunity of inspecting is the "Shannon," and she struck me as being a most unsatisfactory vessel, for reasons already given. The "Nelson" and "Northampton" are an improvement on the "Shannon," but, if I am not mistaken, they are considered in the light of *bonâ fide* fighting ships, and by the Chief Constructor of the Navy as superior to such a vessel as the "Temeraire." In this opinion I cannot coincide. The latter will throw a broadside of 2,400 lbs.; the "Northampton" 1,800 lbs. Their length, breadth, and speed will be about the same. The "Temeraire" has not only a complete armoured belt, but also armoured protection for guns. With the exception of the foremost and after guns, those of the "Northampton" are unprotected by armour, and her belt is not extended to the bow and stern. The "Temeraire" has a bow-fire of three 11-inch 25-ton guns, the "Northampton" only two 10-inch 18-ton guns. As fighting ships, therefore, there is little comparison, and for the protection of commerce such vessels are unsuited. They have not sufficient speed, cannot carry enough fuel, and cost too much money. That such vessels as the "Shannon," and "Northampton," are adapted for a station like the Pacific may be admitted; whether they would have forced the "Huascar" to haul down her colours is an open question, but every probability would be in favour of that result. As regards supplementing our regular cruisers by merchant steamers equipped for the protection of commerce, I am of an opinion that it might be done to a certain extent, but such vessels could only carry light guns, though the addition of a Whitehead torpedo would give them a formidable character. They would be needed in the event of an enemy making use of a similar weapon, and from such a number for selection, we should obtain vessels that could be easily extemporised into efficient cruisers, trusting to their heels when attacked by a more powerful foe. To depend entirely upon such a source would appear to me a short-sighted policy, for if so at the beginning of a war, we should be practically helpless. Rather let us increase the number of those vessels which may combine, in the best manner, qualifications essential to this duty, for on them mainly depends the maintenance of that skill on the sea which more than anything else has given us a just title of efficiency. The necessity of training our young seamen must not be forgotten, and at present this is not properly ensured. A more systematic course of training for officers and men is much needed. I should like to see fewer ordinary seamen sent to our armoured vessels, especially the mastless turret-ships, but all first made to undergo a commission in one of our unarmoured cruisers, where they would learn seamanship in all its branches. If the same course were followed with the Officers, it would be highly beneficial, for if as Sub-Lieutenant, one year at least, were spent in one of these ships, and then two years when first made Lieutenant, we should not have that inequality of experience and efficiency which now exists.

The latest effort to produce a cruiser of great speed has resulted in the "Iris," but she is too costly, for we find that ten corvettes of what

is called the "Gem" class cost little more than four of the "Iris" type. Whether the latter will be cruisers or despatch vessels remains to be seen, but a great objection attached to the "Iris" is the height of her funnels, which will be very injurious to masts, sails, &c., if steaming for any period. I think, however, she would be more generally useful if barque-rigged, at any rate less costly in peace time, and the power would always remain of laying aside anything that might be considered superfluous in time of war.

Naval Volunteer or Supplemental Force.

The question of providing an adequate reserve of seamen in the event of war has been brought forward a great number of times but never received a satisfactory answer, and at present a solution of the problem seems as far off as ever. Considering the population of the United Kingdom, and what the proportion of those engaged in seafaring pursuits bears to the whole, it is astonishing we could not have obtained a better result than what is now afforded by the Royal Naval Reserve. But before creating a reserve we should have a thoroughly efficient standing Navy, and at present there is a dearth of trained and experienced seamen, which would be greatly felt at the beginning of a war. This results from two causes. 1st, Because the supply of men is kept up entirely by the entry of boys. 2nd, Because they engage to serve for ten years, and then a large proportion leave the Navy. As regards the entry of boys, I think that this method of obtaining men is the only one that can be relied upon, and gives a good result in many respects; but there are some great defects which should be removed at all hazards. One is the time these boys are kept in guardships before being sent to sea. A lengthened stay in a harbour-ship at Portsmouth or Plymouth cannot add much to their nautical acquirements, and must be attended with evil consequences, both morally and physically. It is not difficult to understand, with a great number of boys, what an effect a few bad examples will have on the rest; and all Officers who have had experience of these ships bear witness to considerable depravity on board. The shorter time they are there then the better, and I consider that six months in a harbour training ship is quite sufficient. What we really want is more of these sea training ships, like the "Eurydice," and more brigs. We could then also employ many Officers now necessarily on half-pay, and so be training them at the same time. At present in the Mediterranean we have such a vessel in the "Cruiser," and actually send ordinary seamen to her to be taught what should have been learnt before. This is simply because they have been imperfectly trained, and no wonder when we consider how their time has been spent. Take the case of a boy from the west of England: he perhaps goes on board the "Dædalus" at Bristol to join the Navy, and, if passing the test, is sent to the "Implacable" at Plymouth. Here he remains eighteen months or probably two years even, waiting to be drafted to a seagoing ship; so he is eighteen before going to sea, and is rated an ordinary seaman shortly afterwards. Very ordinary is the majority, and I have seen most miserable specimens comprising the greater part of a ship's company. When Russian

officers visited our fleet in Besika Bay, on the occasion of the Duchess of Edinburgh passing through in the "Livadia," they noticed the youthfulness of our crews, and after seeing their men one is struck with the contrast. But probably the chief reason for this is to be found in the painful fact that our men leave the Navy just as they have attained their prime of usefulness. Under the continuous service system men engage to serve for ten years, on the completion of which they will be about 28 years of age. Here we have a valuable acquisition, a thoroughly trained man and in the prime of life, whom we should at all hazards retain in some way or the other. But until very lately we offered him no inducement to remain, and consequently a large percentage leave as soon as their time is up, knowing they can get better wages elsewhere. But what a number of good men we should retain were we to offer as an inducement sixpence a day, in addition to rate of pay at the time, for men to re-engage for a further period of ten years. Roughly sixpence a day is nine pounds a-year. A good man is well worth that, and a thousand would cause an extra expenditure annually of £9,000. Of course it would be optional whether any man should have this inducement held out to him, and knowing that would be an incentive to exertion and good behaviour. The want of good petty officers would not be felt as it is now, nor should we see mere boys given those ratings in default of more experienced men to fill them.

And now we come to the question of reserves. What reliable supplemental force have we in the event of war? An examination of the facts will show that it falls far short of what should be ensured in that event. In view of any probable combination against us, we should necessarily commission all our efficient ships, and fill up with men those short of complement. To do this we should have to empty the home ships, and from the "Excellent" and "Cambridge" could be obtained 1,500 men. But this would not be sufficient, and we should have to fall back on the Coast Guard. Of these there are about 4,000, constituting the only efficient reserve we possess, and a large number of these must be put down as ineffectives. To meet the want of a sudden expansion, the Royal Naval Reserve was instituted, which consisted in obtaining a hold on merchant seamen, by offering a retaining fee of £6 per annum to join, on condition of undergoing a few days' drill every year, when they are placed on an equal footing with our regular sailors as regards pay and provisions. What is the result? We have sent all our sailors to sea, but must have a strong force at home to protect our coasts and man the reserve ships. The Royal Naval Reserve men are called out, and from those who are in England we obtain about 5,000 imperfectly trained and undisciplined men. But now, more than ever, we require men fairly well drilled and accustomed to the discipline of a man-of-war, and that cannot be obtained by requiring a number of merchant seamen to undergo a few days' drill every year; drill, too, that is intermittent or divided into short periods at different times. After all, we do not need a very great number, but our reserves should be thoroughly efficient, for there would be no time to take their training in hand after war had

commenced. I am of opinion that the Royal Naval Reserve is too costly, and could not be relied on except for home defence; but that our reserve should be taken from the Navy itself by some system similar to this. At the present moment, when a man's ten years is up, we offer him an inducement of two pence a day additional pay if he will remain and re-engage. Of course some do, but not the majority, as should be the case, because this only represents £3 more per annum. But I have stated it to be my opinion that, by offering sixpence to men worth keeping, we should immensely improve our crews, and not require to enter so many boys to keep up the number. Some people say, however, the more we pass in and out of the service the better, as we could always obtain them on an emergency by offering a bounty. That seems to me a fallacy, and I would suggest a plan by which in time we could have a really efficient reserve. Instead of inviting merchant seamen who are totally unacquainted with the duties of a man-of-war, allow men who will not re-engage after their first ten years to enter a reserve force, with pay or pension, whichever you like to call it, of fourpence a day, and for which they shall simply have to undergo a requalifying course once a year, with the liability of being called out in war time. They would be free, then, to enter the merchant service, and so gradually tend to bring the two services into closer union; or they would pursue some other calling in their native place, which would not interfere with their periodical drill. Whilst undergoing this they should receive the same pay and allowances as the Royal Naval Reserve do now. So the cost would be the same, but we should have an entirely different class,—men brought up in the Navy, who would have no difficulty in keeping up a good knowledge of the drills they had already learnt. These might be called the First Reserve, and after a total of twenty years' service, be eligible for Coast Guard and other appointments, reserved for pensioners. From these men could be formed a special Torpedo Defence Corps, to perform the work now assumed by the Engineers—that of protecting our coasts and harbours by submarine mines. A certain number from each station could be sent to the Torpedo School-ship for special instruction, and then be attached to the Coast Guard. During the summer they would practise the fitting up and laying down of mines, and in the winter be receiving instruction. To carry out such a project properly, we should, of course, need Officers attached, who could be obtained from the Active or Retired Lists. At the head should be an Officer specially selected, and we have at present two or three well-qualified, and who could thoroughly organize such a scheme as I have roughly sketched. It may be asked, Why not leave the matter of coast defence in the hands of the Royal Engineers? but be it remembered that their ordinary functions are in quite a different sphere, and we could not spare a sufficient number from the Army to assume these duties entirely and everywhere. It seems to me that this is a work especially belonging to the Navy, and that we have in the Naval Artillery Volunteers a body of men well adapted to assist in such an undertaking. I do not mean to say that they could be entrusted entirely with torpedo defence, because the majority have other callings,

and can only give a portion of their time to these extraneous duties. But amongst them are many retired naval Officers and others accustomed to the sea, who could qualify in this new branch. However much the spirit is to be admired which has led to the formation of the Naval Artillery Volunteers, they will not, I am sure, assume for themselves anything beyond a purely defensive sphere. In the hour of need they would be a valuable acquisition, but a volunteer force cannot take the place of an efficient reserve, from which to recruit and expand our regular force in time of war. In conjunction with the Royal Naval Reserve they could be relied on to form a fairly powerful defence against invasion, and to render ourselves secure against that, should be the primary consideration in dealing with the subject of a Naval Volunteer force. The possession of such, if properly organized and in sufficient numbers, would also enable us to despatch a large force abroad, and free the regular Navy for offensive operations, which has ever been its special function.

Want of men seems to be our chief weakness. Ships we have and could buy, but the crews to man them efficiently would not be forthcoming. In France we see the plan pursued of an intimate connection between the Merchant and Imperial Navy, by which nearly every man in the merchant service passes four or five years in the Navy, and afterwards can be recalled in case of war. I believe about 7,000 men pass annually into the Navy, are retained for the period mentioned, and are carefully drilled and instructed. Thus, at all times, France is enabled to obtain a great number of men who have actually served on board a man-of-war, should she need any sudden expansion of her naval force. Of course such a system is not unalloyed with evil, for under it you lose the men just when they are becoming efficient and well-trained, while the weapons of to-day require a greater degree of intelligence and experience than heretofore. I am inclined to think, therefore, that the ten years entry is the best, if we could only have a reliable reserve when any strain is brought upon our naval resources.

There is one point which deserves to be remarked, and that is the great number of men on board an English man-of-war who cannot be utilised in the event of heavy casualties at the guns. We are literally inundated with cooks, stewards, and servants, who are only available as carriers, and that under a rigid surveillance. Especially is this noticeable in the Mediterranean, where Maltese form a considerable proportion of our crews. There seems to me no reason why nearly everybody on board should not be instructed in the use of weapons, especially the stokers and mechanics. In the French Navy we find this carried out, so that the fighting strength of one of their ships is, humanly speaking, numerically superior to one of ours of equal size. I am not of those who advocate the abolition of the Marines, but rather would desire to see their numbers increased, especially on board ship. The plan adopted some time ago of utilising them as officers' servants appears to me worthy of extension, but they should be in addition, and not deducted from the strength of the detachment. If bands could be obtained from the same source, it would

be a great improvement on the present system, by which we obtain wretched musicians, and men useless for fighting purposes.

In leaving this portion of the subject, I will briefly recapitulate what appears to me to be required for a Supplemental Naval Force.

That we should have a First and Second Reserve.

The First Reserve to consist of Coast Guard men, and men who, having served ten years in the Navy, are given fourpence a day on condition of their undergoing certain drills during the year, with the liability of being called out in war time.

The Second Reserve to consist of the Royal Naval Reserve and Royal Naval Artillery Volunteers.

The former to man extra ships and fill up vacancies, the latter to be employed in coast defence. That a special Torpedo Defence Corps be established, consisting of sailors who have served their time at sea, and Officers who have retired from the Navy, or have had some connection with the sea.

That a reserve of Officers be obtained by giving certain appointments to the Retired List, to include the Coast Guard Service.

That the force of marines be increased.

Colonial and Home Defence.

The necessities of Colonial and Home defence would appear to assimilate in their conditions, and yet some difference exists which leads me to treat them separately.

Now, as far as our Colonies are concerned, it cannot be doubted that we must be satisfied with such dispositions as will enable them, at any rate, to exhibit some power of defence, independent of any assistance the mother country may afford. Not that I infer they should be left to their own resources, but simply to imply that upon every colony which claims self-government devolves the duty of providing some measure of self-preservation. We must always bear in mind that any nation engaged in war against England could find an extended sphere for offensive operations in our Colonies and distant possessions. Against these, and the destruction of our commerce, foreign writers have always declared would be the direction in which the power of their country would be applied in such an event. Though England has never carried on a defensive warfare in so far as the Navy is concerned, but always exhibited a vigorous offensive movement as the best defence, yet in the contingency of an enemy's force eluding our vigilance and appearing off any of our possessions, there should exist some defensive organization to offer a successful resistance.

I am afraid that few of our Colonies possess this, and also that we were somewhat hasty in withdrawing our troops till such had been assured.

Six years ago I was stationed in the Pacific, and was much struck with the isolated and unprotected state of our possessions in that quarter. British Columbia and Vancouver's Island would be practically helpless, for at that time (and I think it is unchanged), there was not a single fortification or gun mounted, and no armed force, except

a few volunteers. In 1870, British Columbia was incorporated with the Dominion of Canada. Since then, instead of thoroughly organizing a system of defence, they have done nothing but squabble about a railroad which Canada pledged herself to build across in ten years, but now finds it necessary to abandon. At present there is practically no communication, except through the United States, and under such circumstances, Colonial defence assumes a great importance, for unable to alter facts, we must endeavour to provide something out of the materials at hand. A country like Canada has great resources in this respect. An extended sea frontier and vast fisheries gives her a seafaring population numerically large. Here is the foundation of a splendid Naval Militia. Give them training, and you have a reliable force in time of need. But before dealing with this part of the subject, it is necessary to determine—1st. What points are to be strengthened; 2nd. In what manner they shall be defended.

Now it seem to me certain that in view of the gigantic dimensions of our foreign possessions we must be satisfied with a limited number of well-defended points, rather than attempt an all-round defence. These places have been settled by general acknowledgment, but little effort has been made to carry into effect any substantial measure of defence. As regards the manner in which such points should be defended, I will assume that the chief danger to be feared is from the sea, and experience teaches us that stationary fortresses have not a value corresponding to their cost, but of all such defences those formed of earth have the greatest advantages when exposed to a heavy fire from large guns. Earthworks, then, may form part of our system of defence, but they should only exist at special points, and be supplemented by vessels and torpedoes. For the defence of Colonial harbours we require vessels carrying the heaviest guns, and protected by armour-plating of average thickness; and I think the nearer they approach to floating fortresses, as distinct from the ordinary type of ship, so much the more efficient they will be in the special purpose for which they are to be employed. Attached to these vessels should be a certain number of gunboats, carrying one heavy gun, with sufficient beam to give a steady platform without aiming at great speed, a quality not essential to harbour defence. Furthermore, torpedoes must be largely made use of, and they will be found most efficient for closing entrances and channels. To supply the men to work these various weapons I would suggest that our principal Colonies have a small standing navy, just sufficient to keep the ships in order and for training, and that a reserve be formed similar to our own Naval Reserve, which shall be in detachments of men undergoing a certain period of drill on board the floating batteries and tenders. There should also be a vessel for torpedo work with its permanent staff, who would instruct and practise laying down mines, selecting those men who showed greatest aptitude to form a special corps. Steps should be taken in the formation of a land force that would co-operate by constructing earthworks, and have an organization complete for immediate mobilization if the landing of an armed force at any point should be threatened. It is certain, however, that little can be done without

material assistance from this country in some shape; and we could well afford a certain sum annually for such an object, in addition to turning over to our Colonies guns and ships that we no longer require.

I would also here point out the necessity of having a dock capable of taking in a large ironclad on every station. We continually feel this want at the present time, how much more should we in the time of war.

What applies to Colonial defence applies also in a great measure to Home defence. There is, however, one thing to be observed, and it is that with a navy powerful enough to blockade an enemy's ports, so as to prevent him issuing forth to make a descent upon your own coasts, you have already an almost perfect defence. But as under certain circumstances this might be impossible, it is necessary that some organization should exist for Home defence alone, which would enable the bulk of our regular force to carry out offensive operations in any part of the world. This duty I would apportion to the reserve, which should be called out on the first declaration of war. Fairly efficient ship's companies could be formed out of the present Naval Reserve, with petty officers from the Coast Guard, and officers from that source or the Retired List.

The most useful manner in which they could be employed would take the form of a flotilla of gunboats, each carrying a heavy gun, and I think it would be an excellent plan if a certain number of these vessels were attached to each reserve ship, and a portion of the drill period now carried out in the large vessel allotted to the gunboats. No better training could be found than getting under weigh, and going out of harbour for the day, in order that they might have practical experience of firing at sea, and derive a general knowledge of other matters connected therewith. In addition to these vessels, each reserve depôt should have attached to it a special torpedo-boat, thus forming a complete unit of defence, composed of an ironclad, gunboats, and torpedo-boat.

As regards what type of vessel is best adapted for the latter, and what peculiar torpedo they should be armed with, I am of an opinion that for the coast of England certain qualifications are imperative, and without under-estimating the value of a high rate of speed, I cannot recognise the usefulness of any type which does not possess a fair amount of seaworthiness.

This hardly seems to have been sufficiently considered in the swift boats that Mr. Thorneycroft has lately been building, one of which was ordered for the Navy, and is now undergoing trial. The "Lightning"—for such is her name—is 84 feet 6 inches long, with a beam of 10 feet 10 inches, and having a speed of 18 knots. This great speed is obtained in a variety of ways, but chiefly in engine power, for she has, I believe, the greatest amount of engine power to displacement of any boat yet built, being about 10 horse-power to 1 ton displacement. What this represents may be better understood by comparison, for, taking recent ships into consideration, the "Boadicea" has about $5\frac{1}{2}$ horse-power to 4 tons displacement, and the "Temeraire"

about $8\frac{1}{2}$ horse-power to 11 tons displacement. I cannot, however, consider the "Lightning" sufficiently seaworthy and handy for our purposes, whereas, by an increase of beam and decrease of length, though it would entail a loss of speed, she would be made more generally useful and reliable. It may be argued that such a boat would never be required to go outside a harbour, but we must remember that the effective range of any torpedo is limited to 600 yards, and therefore an enemy must be approached within that distance. Moderately rough weather would, I believe, prevent such a boat taking advantage of an otherwise favourable opportunity, if not be absolutely unsafe. It has been proposed that fleets should be protected by such vessels—for they can hardly be called boats—against counter-torpedo attacks; but for this service they would seem disqualified, by reason of their size. They are too big to be stowed like an ordinary launch, and quite unable to accompany a fleet independently. An improved steam launch would be more serviceable. At present they are 40 feet long, but by giving an increase of length they may be made qualified to use any torpedo, attain a speed of 14 knots, possess good seaworthy qualities, and yet be stowed on board with perfect ease.

Lastly, we must look upon Submarine defence as a necessity for the protection of our harbours and mouths of rivers. I have stated in a previous part of this essay my opinion that such a duty is peculiarly the province of the Navy, and sketched a plan for forming a Torpedo and Defence Corps. I am aware that the Royal Engineers have, for some time past, been engaged upon this work, both at home and abroad, and their experimental practice is very useful. But I doubt whether their four companies, which now comprise the whole torpedo staff, would be nearly sufficient, and feel certain they would have to be supplemented, not merely in manual labour, but also in men having knowledge of this special work.

I have not here considered it necessary to propose any novel type of ship for purely defensive purposes, such as the circular ironclad favoured by Russia, about which we heard so much before the war, but so little since, for I do not consider them adapted for the coast of England, whatever valuable qualities they may exhibit in the Black Sea. Russia must now regret that so little attention was paid towards constructing an ironclad fleet, for she cannot but feel humiliated in seeing the part her Navy has played in this war. Had she but followed the example of Germany, Austria, Italy, and Turkey, affairs in the East might ere now have assumed a different phase.

I have no more to add on this last point of the essay. My object has been to combine efficiency with economy, and, therefore, no special type is proposed, but simply to utilise the materials we have to the best advantage. I am convinced that a combination of the several points here laid down would render the country secure against attack, and assure the object of coast defence.

Conclusion.

I shall conclude with a few general remarks upon certain matters

that appear to me worthy of consideration in the organization required to secure a powerful and economic Imperial Naval Force. I do not intend, however, to propose any change that will involve a large outlay, for with but a slight increase of the present estimates we ought to obtain a Navy that shall be above suspicion. I shall only, therefore, offer some suggestions appertaining to officers, men, and ships, which I think, if carried out, would tend to increase the efficiency of the service. There are few matters connected with the Navy about which opinion is so much divided as that of the entry and early training of naval Officers. Aristotle has said that, "All who have "meditated on the art of governing mankind have been convinced that "the fate of empires depends on the education of youth." With equal truth may it be said that on the early training of Officers depends much of the general efficiency of the Navy.

For such an exceptional career it can hardly begin too soon, and yet experienced men have asserted their opinion that Officers should not go to sea till the age of 18 or 19. Simultaneously has arisen a predilection for a college education, and a tendency to unduly exalt theoretical knowledge over practical experience. A decision has been arrived at to replace the "Britannia" by a college on shore, whereas my own opinion is that the former fulfils in an admirable manner the purposes for which she was originated. Here the youthful mind receives its first impressions of the after career, instinctively becomes imbued with the spirit of discipline, and indirectly acquainted with professional attributes. At the same time there is no reason why the internal arrangement of such a ship should interfere with any course of study that may be deemed essential, and if the expense of this establishment be mooted, we must also remember that it forms an item in our maritime strength.

If, however, it is settled beyond recall to have a college, but not the site, I would strongly urge the vicinity of Portsmouth, which is our chief naval port, and where opportunity would be afforded of observing all the important matters connected with the fitting out of ships, their armament and machinery, thus enlisting all the sympathies of the boys in that profession which they have entered. I have a vivid recollection of the delight which a visit to the dockyard always afforded me as a cadet, only equalled by an excursion on board a *bonâ fide* man of war.

As regards the education when on board a sea-going ship I think it would be advisable not to appoint midshipmen to ships that have no Naval Instructor, for many of the failures to pass examinations can be traced to that source; but that all Sub-lieutenants should spend a portion of their time at least in a small ship, and so gain practical experience and a good knowledge of seamanship.

A great evil at present is the time young Lieutenants spend on half-pay when first promoted. All should at once be sent to the gunnery ships for a course of gunnery and torpedo instruction, and then appointed to sea-going ships, the first selections being made by order of merit. It seems to me that it would be far better to have an additional Lieutenant in every sea-going ship, for whom instructiona.

and other duties could be found, rather than put them in harbour ships, where they can gain little professional knowledge.

As regards the employment of Commanders after promotion, I do not think it can tend to efficiency that Officers on the Active List should hold Coast Guard appointments; especially now, when naval matters are daily becoming more complicated, and scientific advance renders a close and continued attention an imperative necessity. Such a period as must elapse before appointment to a sea-going ship would be more advantageously applied in a study of the higher branches of nautical subjects. That many do so now, shows commendable zeal, but a good deal hinges on the question of half-pay, and I hope the day is not far distant when some modification of the present system may be deemed feasible.

Of an equal importance with all that concerns the efficiency of Officers, is a similar care for the training of our men. Complaints are now being freely raised as to the scarcity of petty officers and mechanics, as well as to the rawness of our crews. I have before attributed much of the latter to the loss of most of our best men after their first ten years has expired, for want of a sufficient inducement to remain. The scarcity of mechanics and artificers is owing probably to the advance of all wages on shore, so that in the Navy we cannot obtain good workmen. The hope and knowledge of a future pension does not counterbalance the prospect of a larger sum at once. Under such circumstances, there is no choice but to increase the pay, and obtain good men at a greater cost.

There is no difficulty, however, in obtaining sailors. We take them as boys, train, and then let them go. More than sufficient come into the Navy, and if, as many assert, they are an expensive article, all the more reason for retaining them when beginning to repay some of the time and money expended on their training. It is said that every boy we train for the Navy costs the country at least £300 before we make him an able seaman. I myself am so convinced of the importance of naval discipline and training from earliest youth, that I do not think any other system advisable, and the extra expense is well redeemed. I think, however, that the want of able seamen and petty officers, now so much felt, might be prevented in a measure by a more extensive sea-training for ordinary seamen in special ships, whereas men are now pushed on to fill vacancies in higher ratings without ability or experience. For such reasons do we see occurring occasionally those mild outbreaks on board ships against discipline, which result almost entirely from want of authority and influence on the part of the older hands.

In these days of costly and complicated weapons, more than ever is it necessary that all training should be thorough. Among other great improvements of late years, none has effected such great benefit to the service as the School of Gunnery at Portsmouth. The time has, however, arrived when the want of the service in this respect has outgrown the establishment. The increase in the number of men, and the course they undergo, would seem to urge some change in existing arrangements, and I would recommend a building on shore, with a

sea-going gunnery-ship attached. The "Excellent" obviously does not fulfil all the conditions now necessary to give the training required, and the way men fall short when actually firing at sea is lamentably observable. This simply results from want of practice in engaging a movable object, for most of the firing takes place from an immovable platform or deck, at a stationary target. When under weigh, and proceeding at a certain speed, a very different result follows, and considerable practice is required to make even fair shooting; so there has been a tendency to reduce the speed, and attention has been called to the Admiralty order that target practice should take place at a rate of eight knots.

For this and other reasons I advocate a gunnery establishment on shore, with tender attached, and drill-sheds for carrying on other drills in all weathers. At present half the time is spent in pulling backwards and forwards, while for wet weather little or no provision is made. Such an establishment might include gunnery and torpedo, for the latter is now assuming an equal importance, and certainly, for a country like England there is room for improvement in this respect.

But a few words as regards ships. They are rapidly losing their old individuality and assuming a new. That this should happen was patent to all when the struggle began between ordnance and armour. Under the influence of old associations and ideas we still strive to retain some of those attributes for which our ships have been distinguished, but in most cases success has not attended our efforts. We cannot yet come to the conclusion that for a fighting ship masts are no longer necessary, but they also reduce the offensive capacity of a ship. What the "Inflexible" may be in the future, rests probably on the decision of a few experts; but I doubt that, under any circumstances, her sail power could save her from disaster or conduce to economy.

I have in this essay jotted down some of the impressions my mind has retained from time to time when on active service. Many of the ideas here expressed no doubt are crude, but if a few only should lead other people to think upon the same matters, the labour will not have been thrown away.

GREAT BRITAIN'S MARITIME POWER, HOW BEST DEVELOPED, &c.

By Commander Gerard H. U. Noel, R.N.
(Gold Medallist, 1876.)

"Arma pacis fulcra."

Introduction.

The difficulties to be contended with in writing an essay of this description are numerous, and even the most able and politic writers can scarcely avoid the appearance of being didactic and presumptuous; indeed, it almost seems a part of the writer's duty—in order to explain his views to the full advantage—that he should observe his subject from points infinitely higher than his natural position. Our subject on this occasion is so comprehensive that the difficulties are more than ever multiplied, and in grappling with them we must endeavour to view the aspect of affairs, not only from the stand-point of authorities on all branches of the naval service, but also as a "great national "question."

We might envy the prize essayist of last year, and others whose papers were honourably mentioned, and published in the Journal of the Institution, not only on account of the ability and profound historical knowledge displayed, but also for the fact of their subject being one which (while leading to equal honours) was not calculated to draw from the writers opinions and views opposed to those held by people in authority, nor likely to evoke sharp criticism and severe handling at meetings for discussion.

However, we must endeavour to master the difficulties, and trust for the indulgence of those to whom a too decided expression of our views may appear presumptuous.

Part I.—*On Naval Policy and Administration.*

(This part is omitted, it having been judged by the referees as containing observations that did not come within the limits assigned to the essay.)

Part II.—*On Fighting Ships.*

The fighting ships of the Royal Navy we will divide into four series.

The first series will include all sea-going vessels over 5,000 tons; these will compose the ironclad fleet.

The second series will include all vessels between 2,000 and 5,000 tons; these will be the "fast ocean cruizers," some slightly protected with armour, and all being rams.

The third series will include all the smaller sea-going vessels.

The fourth series will include the coast defence ironclads, gunboats, and torpedo vessels.

In treating this portion of the essay, it will be convenient to refer to the last prize essay on naval subjects, which includes all the different types of vessels necessary to fight our battles on the ocean and near our shores, and will therefore form a basis to work on, and be a guide for our arguments. Since 1875 there have been several small

items of naval warfare afforded us, and besides this, various inventions and improvements in material, which are likely to influence the manœuvring of fleets and the construction of war vessels.

The First Series: Ironclads.—To begin with our principal fighting ship, our ship of the line, our champion in all parts of the world, the embodiment and upholder of our power, what is she to be?

She must be a swift and powerful ram, she must carry guns and torpedoes, and she must be armoured to an extent compatible with absolute safety as a sea-going vessel in peace time, with the most perfect protection attainable of her vital parts in action; and she must be constructed with so large a reserve of floating power, that she may sustain considerable damage below the water-line without fear of sinking.

Let us now glance at the services a vessel of this description may be engaged upon. *First*, she may be opposed to her counterpart in single combat: here the result would principally depend on the skill shown in managing the ship and the proficiency in gunnery practice, the guns necessarily having a large arc of training. *Secondly*, she may take a post in the line of battle, where her ram-bow will be her chief weapon, and she will bring her guns and torpedoes into action, as opportunities occur. *Third*, she may be opposed single-handed to a squadron of gunboats, each carrying one heavy gun. This will necessitate her carrying a fair number of guns of limited size, and making good use of them. *Fourth*, she may be opposed to forts, in which case her ram and torpedoes will be useless, and her guns of paramount importance. *Fifth*, she may be opposed to two or more unarmoured vessels, in which case her battery of moderate sized guns would be invaluable, torpedoes and ram-bow being used when practicable.

We, therefore, come to the following conclusions on the question of armament for sea-going ironclads: a ram-bow of necessity; a fair number of moderately heavy guns (*i.e.*, twelve to twenty tons in weight), having a large amount of training (possibly 90°), and torpedoes to any *safe* extent that may be thought desirable.

Going further into particulars, first with respect to the shape of the ram-bow, opposing Mr. Scott Russell's theory in favour of the "*chisel*" versus the *punch*, let us join with those Naval Officers who advocate the "Hercules'" stem as a pattern, and prefer it to the sharper snouts of the "Devastation" and "Bellerophon," or the new types exemplified in the bows of the "Inflexible" and the "Nelson." As regards the strength of the ram, it appears only wise that a part of the ship of such eminent importance as the stem should be equal to encountering any possible strain without damage: and here we may learn a lesson from the above distinguished authority, who says as follows:—"For "this purpose the stem must be formed by gradually growing out of "the ship's bows in plates overlapping thicker and thicker until they "become a thick, smooth, inflexible stem."[1]

Next, as to the question of guns.

In support of the argument in favour of a large number of moderate sized guns, the following Tables I, II, and III, have been drawn up, which may be useful in calculating the value of the different systems of armament.

[1] See "Journal of the Royal United Service Institution," Vol. xxi, No. 91, p. 714.

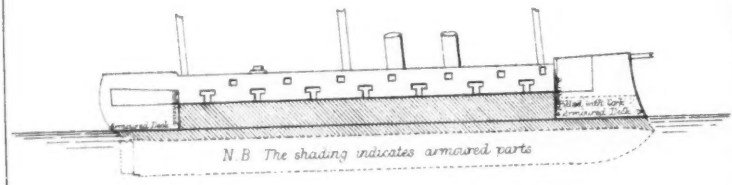
Journal R.U.S. Institution
VOL. 22

PLATE I

SEA GOING IRONCLAD 16 GUNS, 8,000 TONS DISPLACEMENT

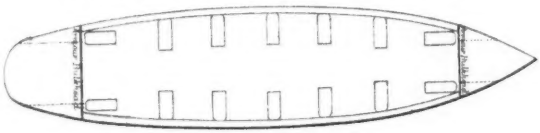
Length 280 feet. Beam 62 feet. Draught aft, 25 feet.

BROADSIDE VIEW



N.B. The shading indicates armoured parts

Horizontal Section through main deck shewing position of Gun platform. The foremost and after Guns pointing towards Bow and Stern



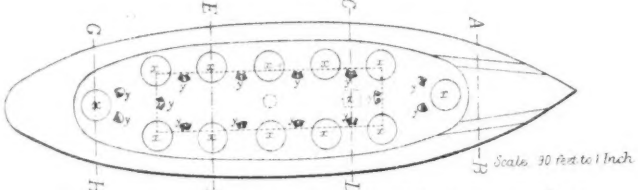
Scale 90 ft to 1 Inch

PLATE 4

COAST DEFENCE TURRET IRONCLAD, 12 GUNS, 10,000 TONS DISPLACEMENT

Length 300 feet. Beam 78 feet. Draught 21 feet.

DECK VIEW SHEWING POSITION OF TURRETS

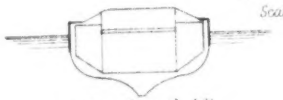


Scale 30 feet to 1 Inch

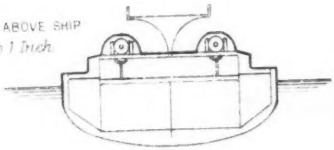
x. Turrets. y Loading scuttles. = ports (six to each Gun) x. Conning Tower

SECTIONS OF THE ABOVE SHIP

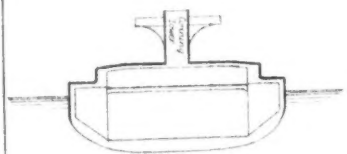
Scale 60 ft to 1 Inch



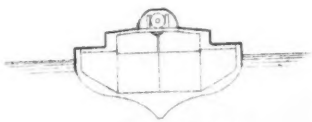
Section through A B



Section through E F



Section through C D



Section through G H.

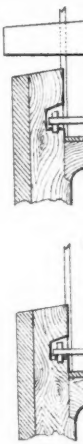
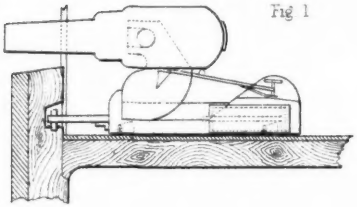


PLATE 2.
SEA GOING IRONCLAD 8,000 TONS DISPLACEMENT

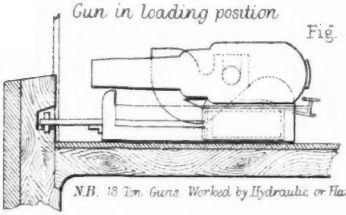
Section through gun-port
Gun in firing position

Fig 1



Gun in loading position

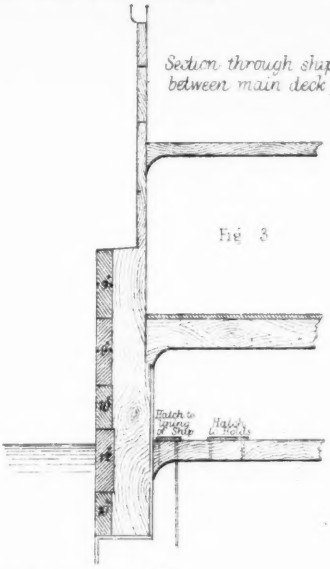
Fig. 2



N.B. 18 Ton Guns Worked by Hydraulic or Hand

Section through ship's side, between main deck gun-ports

Fig 3



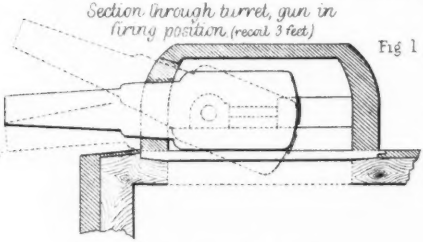
Scale

Feet 4 3 2 1 0 4 8 12 16 20 Feet

PLATE 3.
THIRTY EIGHT TON GUN TURRET FOR COAST DEFENCE IRONCLAD OF 10,000 TONS.

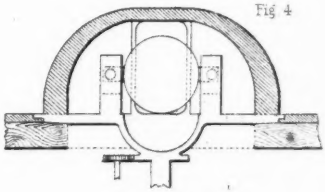
Section through turret, gun in firing position (recoil 3 feet.)

Fig 1



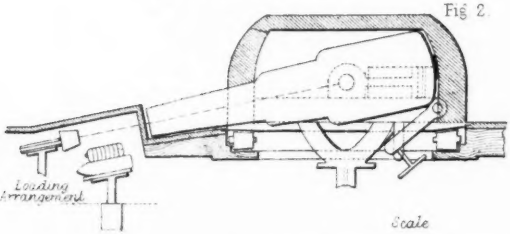
Section through A B (See below)

Fig 4



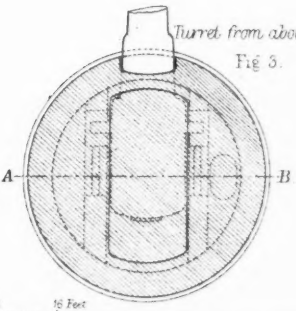
Section through turret
Gun in loading position

Fig 2.



Turret from above

Fig 3.



Scale

Feet 4 3 2 1 0 4 8 12 16 Feet

J. Jobbins

TABLE I.—*Comparative Power and Weight of Guns.*

Nature of gun.	Weight of Battering charge, pebble powder.	Weight of Projectile.	Elevation required for range of 4,000 yards.	Velocity in feet per second. At muzzle.	Velocity in feet per second. At range of 4,000 yards.	Energy in foot tons. At muzzle.	Energy in foot tons. At range of 4,000 yards.	Piercing powder. Thickness of iron armour in inches, pierced at 100 yards.	Total weight of gun complete with ammunition and stores.	No. of guns composing 1,000 tons of armament.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	Lbs.	Lbs.	° ′					Inches.	Tons.	
16-inch 80-ton..	370	1,700	..	1,520	1,179	27,213	16,389	26·4	About 250	4
12·5-inch 38 „	130	800	7 10	1,451	1,052	11,676	6,137	17·7	„ 100	10
12 „ 35 „	110	700	7 17	1,300	987	8,200	4,728	14·6	„ 85	12
12 „ 25 „	85	600	8 9	1,300	968	7,030	3,900	13·1	„ 67	15
10 „ 18 „	70	400	7 56	1,364	982	5,160	2,675	12·0	49½	20
9 „ 12 „	50	250	8 17	1,420	945	3,496	1,548	9·6	33	30
8 „ 9 „	35	180	8 34	1,413	920	2,492	1,056	9·5	26	39
7 „ 6½ „	30	115	7 30	1,525	916	1,855	669	7·1	18¼	55
64-pdr. 64-cwt. ..	8 R.L.G.	64	..	..	..	..	..	0	7⅓	136

The first nine columns of this table are taken from the "Treatise on "the Construction of Ordnance, 1877," and may therefore be fully relied upon; of these Columns 3 and 4 show us that the range and velocity of all heavy guns are so nearly the same, that in our calculations of the power of guns we may fairly estimate them as equal. Columns 7, 8, and 9 are interesting in showing the work that can be done by the heavier ordnance; this has already been increased by the enlarging of the powder chambers of the 80-ton and 38-ton guns, an important discovery which will no doubt be extended to all heavy guns. Column 10 is partly taken from the "Record of Naval Ord- "nance," the weights of the three first guns, with their ammunition and gear complete, being an approximate estimate. Column 11 is a calculation of the number of guns of different calibres, as they might be carried on board ship, the total weight of armament in each case being 1,000 tons.

TABLE II.—*Comparative Rapidity of Fire, obtained from Official Reports of Prize Firing in* 1875.

Nature of guns. 1.	Names of ships and number of guns of which average was taken. 2.	Average (actual) time of firing 8 rounds. 3.	Average time of firing 1 round. 4.	Average number of rounds that can be fired in 10 minutes from 1 gun. 5.
16-inch 80-ton..	No trial, but roughly estimated at	′ ″ .. ″	′ ″ 3 20	3
12·5-inch 38-ton	„ „ „ „	..	2 30	4
12 „ 35 „	"Devastation," average of 4 guns.	16 5	2 1	5
12 „ 25 „	"Monarch," „ 4 „ .	16 22	2 3	5
10 „ 18 „	"Sultan," „ 8 „ .	9 30	1 11¼	8½
9 „ 12 „	"Triumph," "Iron Duke," „ 20 „ .	5 15	0 39½	15
8 „ 9 „	"Northumberland," „ 24 „ .	6 50	0 51¼	11¾
7 „ 6¼ „	"Agincourt," „ 22 „ .	6 43	0 50¼	12
64-pdr. 64-cwt.	"Triumph," "Iron Duke," „ 4 „ .	4 34	0 34¼	17½

In this table we have official record of the rapidity of firing the guns of 35 tons and under, and in all these cases the firing was judged to be good, or the ships would not have stood so high in the lists as they do. The "Iron Duke" and "Triumph," with their 9-inch 12-ton guns, made the best gunnery practice; the "Northumberland" and "Agin- "court," with smaller guns, falling short of them in time, the latter principally owing to the difficulty of laying the guns accurately and quickly with tackles instead of winches for training.

Column 5 gives the number of rounds that can be fired by one gun in ten minutes deduced from the trials previously recorded in columns 2 and 3, in all the cases except the first two, which guns have not yet undergone the test. In order to make this table more complete, we have estimated three rounds in ten minutes for the 80-ton, and four rounds in ten minutes for the 38-ton gun, as being, if anything, an exaggerated representation of the rapidity of their fire.

TABLE III.—*Comparative Value of Systems of Armament, the Battery in each case being of equal weight, viz., about* 1,000 *tons.*

No. of systems.	Nature of guns.	No. of guns in each system.	Total No. of rounds that can be fired by *all* guns in 10 minutes.	Total weight thrown by *all* guns in 10 minutes (in tons).	Total energy displayed at 4,000 yards by *all* guns in 10 minutes (in foot tons).
1.	2.	3.	4.	5.	6.
1	16-inch 80-ton	4	12	9·1 tons.	196,668
2	12·5-inch 38-ton	10	40	14·3 „	245,480
3	12 „ 35 „	12	60	18·7 „	283,680
4	12 „ 25 „	15	75	20·1 „	292,500
5	10 „ 18 „	20	170	30 „	454,750
6	9 „ 12 „	30	450	50 „	696,600
7	8 „ 9 „	39	458	36·8 „	483,648
8	7 „ 6½ „	55	660	33·9 „	441,540
9	64-pdr. 64-cwt.	136	2,380	68 „	

In this table we have arranged, in order, nine systems of armament, the battery complete with ammunition and stores in each case weighing about 1,000 tons. Column 3 is the same as Column 11, in Table I; Column 4 is obtained by multiplying the preceding column into Column 5, Table II; Column 5 (of Table III) is obtained by multiplying the preceding column into Column 3, Table I, and reducing the result to tons; and Column 6 by multiplying Column 4 into Column 8, Table I.

Studying the results produced in this last table, we observe that System 6 (viz., thirty 9-inch 12-ton guns), can not only throw five times as much weight of metal as System 1 (80-ton guns), and 2½ times as much as System 3 (35-ton guns), in a given time, but also more than trebles the total remaining energy displayed in the same period by System 1, and doubles that displayed by System 3, even at so great a distance as 4,000 yards.

The much-despised 64-pounder battery (System 9) throws half as much again as the 9-inch battery (System 6) in weight of metal, but their power of penetrating armour is, of course, *nil*.

What must appear clear to everyone is, that moderately heavy guns can be carried in greater numbers, can be fired with greater rapidity, and are nearly equal in range and velocity to the heavier ordnance; and with these facts, if we look abroad at the armour-plating of nearly

all the ships we may have to oppose, we can safely decide that a 12-ton 9-inch gun is sufficient for nearly all purposes of ocean warfare, and that a 20-ton gun will probably be sufficient for any future emergencies; so that, if we can get batteries consisting of such ordnance, safely and steadily carried in wholesome, well-built ships, our object is gained, as far as gun-power is concerned.

The fact is, that the 9-inch is the gun most readily handled on board ship; it can be loaded and worked with more facility than any other, and a ship of 5,000 tons, especially built for the purpose, could be made to carry with ease a weight of 500 tons of these serviceable weapons.

Matters would be much improved if it were established that no ocean-going ironclad should carry a gun of more than 20 tons weight, this being the limit of size of the guns for our ships of the line. Special ships, for special purposes, might go to the extent of the present 38-ton guns, but that is the last limit of size that can be effectually handled at sea.

Larger ordnance can only be carried in such small numbers, that aim so uncertain as it must be from an ever-moving platform risks the object not being struck, when such an infinite value is concentrated in one discharge, that any failure is most serious, and before the gun can be ready again, the opportunity may be lost. Mr. Scott Russell, in his lecture on the "Development of our Modern War "Fleet," speaks of breech-loading shell-guns being carried in large numbers, and these to be without training, able only to fire on either beam, with a few for firing ahead and astern. This arrangement did not meet with approval in the discussion, though a system of guns on permanent bearings would be as valuable as any other *in a general action, so long as the motive power of the vessel remained intact;* these are the only circumstances, however, under which training of guns would not add materially to chances of success.

The lecturer, on the above occasion, no doubt advocated this system on the principle of simplicity, and of avoiding complications, and this principle cannot be too strongly urged.

He says: "Though I am an engineer, though I believe in machinery, "I advise you not to believe in clever tricks of mechanism, that I or "anybody else teach you; and be sure of this, first, make your rudder "and your steering-gear, and everything belonging to it, so that "your crew can steer without engines or machinery; secondly, have "your guns so arranged that they can be worked without a steam-"engine being in good order, or the hydrant-press being in perfect "condition, or without all the lines of the mechanism being mathe-"matically true; take care that you can work, with your own crew, "your own guns."[1]

What could be more straightforward and to the point than this warning, and what more in favour of moderate sized guns, that can be worked by hand, and are not dependent on steam or hydraulic machinery, which may be rendered unserviceable by the least bruise.

We will now say a few words on torpedoes, the last invented

[1] See "Journal" of the Institution, Vol. xxi, No. 91, p. 751.

weapons of destruction. What with Whitehead, Harvey, and boom torpedoes, a sea-going vessel ought to be able to do some damage to her opponents; but the uncertainty of their action limits their destructive power, and the danger of carrying and manipulating them considerably lessens the expediency of using these weapons in great numbers. It will, however, be necessary that all our vessels should be supplied with torpedoes as an auxiliary arm, and that ships proceeding to foreign stations should be also provided with sufficient stores to enable them to extemporize harbour defences and protect our colonial ports, in case of necessity, by laying down torpedoes.

So much for the offensive part of a man-of-war, which is of primary importance, for, as Commander Dawson, in the course of discussion, most truly says, "the purposes for which ships of war are built are to "damage and destroy, by any means, hostile vessels and fortresses "rather than themselves merely passively to keep out destructive "projectiles."

Having decided on the general principles of our armament, let us proceed with a short description of the ship that is to carry it.

In the essay referred to at the beginning of this part, the writer is strongly in favour of making sea-worthiness. with a large reserve of floating power, the first of all considerations. In this, the whole Navy must agree with him.

Next, of constructing a ship in a manner that will admit of her carrying powerful engines and steering gear, both well sheltered from the dangers likely to be incurred in action. This, again, all will consider advisable. On coal-carrying power, nothing particular is said in this essay, but Mr. Scott Russell and others strongly advocate the coal-space being increased, so as to enable a ship to steam at least 5,000 miles. If you put aside $\frac{1}{10}$th, or at most $\frac{1}{8}$th, of displacement for weight of coal, it will be as much as we can afford, and then we must decide on giving our sea-going ships sail-power to assist them. We read, in the lecture on "Our Modern War Fleet," that power of carrying coals depends on the length of the ship. Surely this alone is a good reason for stinting the amount to be carried, for, though the lecturer declares that he is able to make any length of ship as handy and easy to turn as the most perfect of our present vessels, there is no doubt but that, on the same principle, he could make a shorter ship infinitely more handy than his ship of great length. So, as we *must* have handiness, we must limit our length, and this will limit our coal-carrying power. A man-of-war has not only to make long passages, but her engines must be heavier, in order to stand the undue strain which may happen in manœuvring or fighting, and, what is even more fatal to her power of steaming, her boilers must be low down and under protection, and, when so placed, can only with the greatest difficulty obtain the requisite draught.

Going on now to the question of carrying armour, which is the protection against artillery, in the last Naval Prize Essay, a belt, 10 feet wide, is recommended for all ships of the line, the thickness of the armour varying with the tonnage; and it is proposed that this belt be built up at the bow and stern, to protect the ship from raking

fire. But this plan has its drawbacks, and no doubt is subject to improvement. In the first place, looking at the midship section of a ship so plated, it becomes very apparent that you must either cover the deck, joining the upper parts of the belt with armour, to prevent a shot that passes close over the near-belt with a slight curve, knocking away the opposite side at the water-line, or doing great damage by taking the armour plates in reverse, or you must build your armour higher, if you do not wish to plate your decks. Next, the gun-carriages and pivot-bolts are wholly unprotected, and lastly, the armour forward and aft is heavier than it should be in a sea-going ship. Now, without departing from the main principles of the former essayist, namely, "of placing the heaviest armour over the vitals; of "avoiding top weight, and of arranging the battery along the whole "broadside," we will endeavour to work our plating into a more serviceable shape, and so afford a slight protection for our gun machinery, a reduction in the weight at the extremes, and in the danger of curved fire from abeam. It seems that this might be done by constructing a 6-foot belt of armour from the water-line downwards, all round the ship, and a belt, 12 feet high, above the water-line all round in the wake of the battery, such battery being three-fourths of the length of the ship, and then sealing in the part before and abaft it, by an armoured deck at the water-line, the forepart above this deck being filled with cork to a height of 8 feet; we should then have the armoured part of the vessel 12 feet out of water throughout three-fourths of her length; the armoured bulkhead forward (forming part of the battery belt) would be raised to an additional height of 8 feet, for protection against raking fire from ahead. See Plate I (Vol.-Plate XI).

The amount of armour must vary in proportion to the size of the ship, and taking this at ·225 the whole weight, we could manage to plate a vessel of 8,000 tons on the above principle with 12 and 10-inch armour at the water-line, and 10 and 9-inch armour above this, as high as the gun-portsills. This system would be applicable to all ships intended as sea-going ironclads, whatever their size, no ships of the line being under 5,000 tons, the armour belts varying very little in width, but being thicker or thinner according to the size of the ship.

The position of the armour governs the position of the guns, which, in the system here represented, form a battery extending over nearly three-fourths of the length of the ship, and it could no doubt be easily arranged that both the guns' crews and the machinery of the battery should be kept almost entirely out of harm's way, by making the guns to recoil partly under shelter, and having the deck on which they work about 4 feet below the portsills, the guns when in, resting in a position half under cover of the protecting armour (see Plate II, Figs. 1 and 2), and the crew, by stooping down, would get the same shelter, always being placed on the side nearest the enemy. The bow-fire would be provided by two guns on the upper deck, which would work over the upper part of the fore bulkhead on each side, and, in the event of a chase, the two foremost main-deck guns could be trained ahead, and fired through ports, which on other occasions

would be kept closed; the two after main-deck guns firing aft, when required, in the same manner, but being usually fought on the beam.

With regard to the construction of the remainder of the ship, let us suppose the part which is armoured, and all below it, to be complete as a floating and perfectly stable body, with plenty of freeboard; upon this let the upper works be constructed, as light as it is possible to make them, compatible with power to resist the concussion of the guns. The size of the ports would be unlimited, the upper part being large enough to allow of a great range of sight, and the ship's side—composed of material that does not splinter—would be built up on the inner part of the armoured wall, so as to admit of its projecting about three feet, and thus affording protection to muzzles of the guns from a vessel sweeping past, in contact with the ship's side (see Plate II, Fig. 3); the deck above the battery would be slightly built and only strengthened in the positions of the bow-guns and conning-tower. On this spar-deck small guns would be worked, to point in every direction, and defend the ship against boat attacks.

For our principal protection against torpedoes, rams, and other subaqueous weapons, we must examine the plan of our holds; here again we have the valuable advice of Mr. Scott Russell, who proposes a system of casemates, "and closed compartments entered only from "above." It is imperative for the safety of a ship-of-war, that she be divided into compartments, and we must put up with the inconvenience of difficulty in communications. Let all below the battery deck be carefully divided off, and if this can be more securely done by constructing the ship in different casemates, or tanks, and joining these tanks together in the build, by all means let this plan be adopted.

The lecturer on our modern war-fleet proposes to build his casemates up to the upper deck, enclosing one or two guns in each, and in some of our present ships, we have already half bulkheads, or traverses between the guns, with the idea of protecting the crews from splinters, and from the concussion of adjacent guns. It would be preferable if the battery were entirely clear, not a scrap of iron that is not absolutely necessary, or anything that would make splinters, showing above the line of the portsills; but immediately below the gun-deck, the bulkheads should come up to the beams, enclosing spaces twenty feet long, and half the section of the ship in width and depth, with no communication between them lower than six feet above the water-line. The most difficult communications to arrange will be between the engine-room and stoke-hole, and those for the transport of coal. But in the first case this difficulty can be greatly lessened by the use of bulls-eyes in the bulkheads, and voice-tubes, and in the latter case by having present-use-bunkers, and carriage tunnels for replenishing them from other bunkers when required. Powder, shot, and shell would be hoisted directly into the battery, and provisions, stores, and water are the better placed for having compartments to themselves. Many of these tanks not actually required to be used in action might be made air-tight for the time, so that in the event of a hole being broken into them from outside, the full amount of air above such a

hole would be confined and prevent the water filling more than a certain portion of the wounded compartment. Ventilation will have to be carefully attended to, but that will naturally all come from above, air pumps being freely used. In all the compartments, except those of the engines and boilers, a deck would be constructed at about the water-line, having water-tight hatches leading to the holds below, and also to the lining of the ship. (See Plate II, Fig. 3.)

The explosion of an ordinary torpedo would at most damage or let water into two of these compartments, and the charge of a ram would have only the same effect, if it did not so completely sever one half from the other as to break the whole ship, or unless by skilful handling it managed to rip open a great part of one side, and so fill a large number of compartments, and cause the ship to capsize.

In completing our protections against torpedoes, we have one other method to consider, and that is, some system of obstruction calculated either to frustrate the attack of boats when at anchor, or creeping up a narrow channel, or the attack of the Whitehead and Harvey, when either in harbour, or at sea; harbour or passive obstructions are arranged without much difficulty, but how to ward off the Whitehead at sea is a more complicated question. However, this is now in the hands of an able Committee, and we may be sure, before we have these torpedoes fired at our ships, some protection will have been organized to render them powerless.

The controversy of torpedoes *versus* protection, is now resolving itself into one similar to that of guns *versus* armour, but to all appearances the result in *sea*-fighting will be reversed, in that the protection will gain the day, whereas in the other controversy the guns are decidedly victors.

To summarise the foregoing principles: our ship-of-the-line will be constructed as a ram carrying a battery of moderately heavy guns and armour-belts round the water-line and battery, but not protecting the upper part of the latter, except from raking fire. The total weights of the armour, the armament, and the coal to be carried, being respectively ·225, ·1, and ·125, the weight of the ship or tonnage of displacement; that is, an 8,000-ton ironclad would have 1,800 tons of armour, 800 tons of armament, and 1,000 tons of coal; the remaining 4,400 tons being the weight of the hull, engines, and equipment; the guns will recoil partly under cover of the armour, all being made capable of firing on the beam, and with considerable training, four that can be fired right ahead, and two right astern when required. The upper works will be as light as possible, with a spar-deck to cover the battery, intended only for working ropes on and carrying light guns for service against boat attacks. The ship to be fully rigged, and of considerable sail power in addition to powerful engines and steering gear, both well under protection, admitting of a speed of at least fourteen knots under steam, and perfect handiness when manœuvring. Torpedo arrangements fitted as considered most convenient by the Torpedo School, and defences against hostile attacks made as complete as possible.

This we intend as the model of our Fleet, that Fleet which Sir

Spencer Robinson speaks of as so indispensable when he says, "Let "that Fleet be the point to which you will gather up all your strength "to fight that battle which will decide perhaps national existence.[1]

The Second Series of Fighting Ships.—We come next to the class of of ships of which the "Shah" and "Amethyst" represent the extremes in size, and we are able to utilise these very two vessels, they having lately proved their powers and failings in an engagement with the "Huascar," a diminutive ironclad ram, carrying four 300-pounder guns in two turrets. The question naturally arises in speaking of this affair, "Would not both of our ships have been twice as formidable to "the enemy if constructed with bows for ramming?" The answer would be "*Certainly*, and they should have sunk the 'Huascar' at "the second, if not the first charge." Again it might be asked, "What would have been the result of the action if with able gunners "the 'Huascar' had succeeded in repeatedly striking her opponents, "and bursting 300 lb. shells at the water-line and elsewhere?" The answer would be, "In all probability our vessels would have been "disabled, and at the mercy of the ram." As Admiral de Horsey admits, it was certainly fortunate for the "Shah," that she had opposed to her a ship carrying guns few in number and infamously worked, which, though of an obsolete nature, are still very destructive, when *skilfully* handled, and employed against unprotected ships. From this we may learn that it is advisable to afford some protection to the vital parts of our cruizers. Corvettes, and frigates of from 2,000 to 5,000 tons displacement, are required as the principal protection of our interests and commerce abroad; we should therefore be careful that they meet these requirements to the fullest possible extent. Such vessels should undoubtedly be rams, and would materially gain in power if protected over the vital parts by light armour to the weight of ·06 of displacement; armament being provided to the weight of ·08 of displacement, and carrying coal of ·16 that weight; we have then ·7 left for weight of hull, engines, and equipment.

Thus a 5,000-ton ship would be protected by 300 tons of armour (that is, a belt 8 feet wide, and 5 inches thick, covering two-thirds of her length at the water-line); she would carry 400 tons of armament, and 800 tons of coal, leaving 3,500 tons for weight of hull, &c.

In order to carry this small amount of armour it will be necessary to slightly increase the beam of the ship; but surely, judging from the extreme crankness of the "Gem" class, and indeed of all the long and narrow unarmoured vessels that have lately been constructed, this would be no great detriment, even if it reduced the speed under steam from 16 to 15 knots in the larger ships, and from 15 to 14 knots in the smaller ones. For it would materially increase their sail power, which is a great consideration, and would also benefit in their gun-platforms, for a crank ship, if listed in action through any cause, may have all her guns rendered almost, if not quite useless, all firing, except on the beam, being impracticable (on the principle of firing with your sights out of the perpendicular), and even beam fire being at a great disadvantage, if not altogether out of the question.

[1] See "Journal," Vol. xxi, No. 91, p. 738.

The armament of our ocean cruizers must necessarily be lighter than that of our ironclads, but the battery of the larger ones should consist of much the same guns as those of the "Shah," except that a frigate of her size, with greater beam, might carry 6½-ton 7-inch guns, instead of 4½-ton shell guns on her main deck. The armament of the "Amethyst" is formidable, but a vessel of her displacement should carry twenty 64-pounders, instead of fourteen.

Light armour has proved itself of more value than was expected, if it is true that the "Huascar," with only 5-inch plates, received so small an amount of damage, though hulled about 80 times with shell from two 12-ton armour-piercing guns, sixteen 4½-ton, and twenty-two 3-ton shell guns. This encourages us to persevere in our attempt to protect the vital parts of our cruizers, at the cost of having to sacrifice a small percentage of speed under steam. All classes of vessels of this nature should be fully rigged, every improvement in the way of material be instituted. That is, all standing rigging of steel or iron wire, and all spars, &c., while retaining the same relative strength, to be as light as possible, substituting steel for wood where practicable, the whole aim being to attain great efficiency of rig, combined with the least resistance to the wind, when steaming to windward.

Belonging to this series, a class of vessels represented by the "Iris" and "Carysford," built of steel, and for purposes of great despatch, all other considerations being subordinate to that of speed, will be found invaluable in time of war. But let such vessels be placed under the heading of "special cruizers" and not treated as ordinary ships for general service. These "special cruizers" would be built on the finest possible lines, of the lightest construction calculated to give them sufficient strength, having up and down bows, carrying no armour, and only a light armament, and should be provided with sail-power only as an auxiliary. Ships so constructed would have their weights divided as follows: armament, ·03 of displacement; coal, ·2 of displacement, and the remaining ·77 for weight of hull, equipment, and engines. That is, a 2,000-ton ship would carry 60 tons of armament, 400 tons of coal, and her hull, &c., would weigh 1,540 tons.

This will complete the second series of fighting ships, all of which will be powerful vessels, fearing neither enemy nor storm, traversing the ocean and protecting all its highways, when England's trade is in danger. They must all carry torpedoes and must be similar to the ironclads in their internal construction, so that they may possess a certain amount of protection against the assaults of torpedoes and the dangers of the rams.

The Third Series of Fighting Ships.—This includes the numerous small craft (sloops and gunboats) whose duty it is to represent the power of England in every petty port, keeping order, supporting justice, preventing piracy, and making the country's name known everywhere. An Officer commanding a German man-of-war which was making a tour of the world, remarked a short time ago, in a tone of great surprise, "I have seen the English pendant in every port I "have visited." *This* is what promotes the power of Great Britain; it

shows every nation and people that England's authority is not only represented by Ministers and Consuls, but that it is supported by forces which are not to be despised. For it is known that the small craft only represent a fraction of a considerable force. The mere presence of this fraction in uncivilised parts of the world has often prevented a disturbance which would otherwise have broken out. Sloops and gunboats are indispensable to England, and their duties are so numerous, that they must not only vary in size, but also in description; some being fast and of deep draught, others being shallow and of less speed, useful for river warfare; all well armed; and the larger ones, those of 1,000 tons and over, being fully and serviceably rigged, so as to economise fuel and afford instruction in seamanship, as well as to have the power of moving from port to port, when it would be impossible to ensure the smaller vessels making the requisite passage. To explain minutely each of the numerous classes composing this series, would take more space than could be afforded in this essay.

The Fourth Series of Fighting Ships.—Our ironclad, or first-class of vessel for coast-defence at home and abroad, should as nearly as possible represent a floating fort, her steaming power and sea-worthiness being sufficient to ensure her safety if caught in a gale on the coast she has to defend. Sail power is unnecessary, as also great speed under steam, but her principal object will be to carry a powerful armament and heavy armour. The present ships of the "Hydra" class, and other mastless turret vessels, would do for the protection of Colonial ports, the larger ones being stationed in the Mediterranean; but should other vessels be built for purposes of our coast defence let them be constructed more on the above principles, namely with heavier armour, greater beam, less speed, and more gun-power; the latter either on a system of several one-gun turrets, or on the "Moncrieff" principle, the guns recoiling under cover of a breastwork. Referring to Table III, page 465, if such vessels were capable of carrying 1,200 tons of armament, a battery of twelve 38-ton guns would be preferable to any other, and if only to carry 600 tons of armament, twelve 18-ton guns. The improvement which is about to be instituted in the "Inflexible," of reducing the gun's recoil to a minimum, and of loading it from a loading-box outside the turret, is a step in the right direction. Let the guns then be smaller, one in each turret, and at least twelve turrets, in each harbour-defence ship. This could be managed by making the turrets a mere armoured shelter for the breech of the gun, admitting of hydraulic working trunnion-boxes recoiling at most three feet, and of the gun being given the requisite amount of elevation and depression (see Plate III), the turret being turned, and the gun depressed, so as to point to the loading-box after firing each round. The manner of arranging the guns would be as follows: the whole battery placed on a breastwork similar to that of Her Majesty's ship "Dreadnought," but of greater length and breadth in proportion. (See Plate IV.) The turntable would work in the deck above the breastwork having the hydraulic slide in its centre, the gun would then be placed on the slide working in trunnion-boxes similar to those fitted for Her Majesty's ship "Inflexible," and afterwards the

armour shield of the turret would be placed over the breech of the gun, and bolted securely, this part being removed when necessary to move the gun. The guns would be laid "by director." These guns would not only have the advantage of great number, but also of an immense arc of training. By sacrifice of speed, a vessel of this description would be constructed with such beam as to allow of her carrying great thickness of armour, which would adequately protect the guns, the ship still being safe as a floating body.

Flotillas of gunboats, each carrying one heavy gun, and supported by small swift torpedo vessels, would complete our coast defence. The former are well represented by the present class of such vessels, and the latter, Mr. Thorneycroft's launches, have brought into notice the marvellous speed that can be attained by these small boats, but the authorities will hardly be contented with a craft so slight and delicate as the "Lightning;" a boat rather larger and more substantial, with a speed of perhaps 17 knots, would better answer our requirements, and we must insist on her possessing a greater power of turning and manœuvring. We will conclude Part II with a few observations on the ships that may be considered our supplemental force.

Mr. Thomas Brassey, M.P., has strongly advocated the desirability of employing armed fast merchant steamers to supplement our Navy, should their services ever be required. The late Mr. W. S. Lindsay, another great authority on such a question, writes in a very instructive and able article in the "Nautical Magazine," December, 1876, proposing to make steamers of 1,200 to 3,000 tons burden, capable of carrying two 7-ton, or four 64-pounder guns; and names the cost of doing this as from 700*l.* to 1,200*l.*, which of course it would be necessary for the Government to defray. By such means a choice from several hundred magnificent steamers might form a reserve of material value, and these vessels will do good service against the enemy's light cruizers and vessels that annoyed our commerce, besides being handy for carrying troops, or, where it was urgently required, coal and stores to our fleets. This would give employment to the Officers of the Royal Naval Reserve, and to many retired Officers who would doubtless be most energetic in putting their full ability into their duty, and with the help of guns, torpedoes, and the great speed of their ships, do good service at little comparative risk to themselves.

Captain Baranoff, of the Russian Navy, so urged his theory of employing armed merchant steamers against even ironclads, that his Government permitted him to arm and put to sea in a vessel named the "Vesta," which, though uncaptured, soon had to retreat when engaged by a Turkish man-of-war, and trust to her superior speed for her escape. This vessel was armed with mortars (most uncertain weapons when fired from a moving platform). Our supplemental ships will not be required to engage ironclads; but will be so *found* that they need fear no cruizer that does not equal them in speed.

Table IV gives a summary of the principal weights to be considered in the construction of the different classes of ships-of-war; also the nature of their armament, and armour protection as proposed in this part.

TABLE IV.—*Descriptions of Fighting Ships.*

No. of series.	Nature of Vessels.	Certain weights as fractions of displacement.				Example vessels.					Armament.		
						Total tonnage.	Division of weight.				Guns.		Nature of bow.
		Armour.	Armament.	Coal.	Hull, &c.		Armour.	Armament.	Coal.	Hull, &c.	No.	Nature.	
							Tons.	Tons.	Tons.	Tons.			
1st ...	Sea-going ironclads	·225	·1	·125	·55	8,000	1,800 9″ to 12″	800	1,000	4,400	12 4	18-ton 12 „	Ram.
						5,000	1,100 7″ to 10″	500	600	2,800	12 4	12 „ 6½ „	„
2nd ..	Large cruizers	·06	·08	·16	·7	5,000	300 5′	400	800	3,500	2 16 8	12-ton 6½ „ 64-pdr.	Ram.
						2,000	120 4″	160	320	1,400	20	64 „	„
	Special cruizers	0	·03	·2	·77	3,000	0	90	600	2,310	10	64 „	Up and down.
3rd...	Small cruizers	0	·05	·1	·85	1,000	0	50	100	850	12	40-pdr.	Ordinary
4th...	Coast defence, ironclads .	·28	·12	·1	·5	10,000	2,800 12″ to 18″	1,200	1,000	5,000	12	38-ton	Ram.
						6,000	1,700 10″ to 15″	700	600	3,000	12	18 „	„
	Gunboats	0	·15	·1	·75	300	0	45	30	225	1	18 „	Ordinary

PART III.—*Organization required to secure a powerful and economic Imperial Naval Force.*

The organization of the Royal Navy will include the entry, training, and employment of the seamen and marines, with their Officers, who comprise our regular sea forces.

The Officers of the Royal Navy are divided into the executive, or combatant, and the civil, or non-combatant. But as the executives have most to do with this part of our discussion, we will devote our time principally to them, and examine the requirements needed, in order that our ships may be efficiently officered and commanded. Comparisons are frequently drawn between Officers commanding our men-of-war and Captains of merchant vessels; and it is sometimes hinted that the latter are of the two more competent to manage their ships. This *may* be the case, but let us just compare the duties that each has to perform. The average merchant steamer is commanded by a man whose employment has been of the same nature the greater part of his life. He probably serves in vessels that make passages on the same route, year after year; and it may be that he has served in a junior capacity on the same line of traffic before obtaining a command. He has little or nothing to do but to navigate and take care of his ship; he has the assistance of pilots on every occasion where it is the least necessary, and his track on the ocean is often laid out for him before leaving England.

The Captain of a man-of-war has to be ready to take his ship to any part of the world, and to do any duty that may be required of him, whether on diplomatic or warlike service. He has to enter ports strange or otherwise, and to make passages with which he may have no acquaintance. He has to manage his ship as part of a squadron, and manœuvre in all sorts of intricate evolutions, and in addition to this he has innumerable duties to attend to in order that his ship may at all times be thoroughly efficient and ready for service. The merchant Captain, running his regular route, may possibly be more competent to keep his ship out of danger; he may possess equal ability, and as the duties required of him are fewer and of a simpler nature, he is probably more experienced in them.

In the same way the engineers of the mercantile marine, as compared with those of the Royal Navy, have every advantage; they are often, if not always, brought up to manage the engines that they have to work on board ship, they have the same duties year after year, and the same description of machinery to deal with. Being thus constantly employed, who can wonder at their becoming adepts, and ensuring by their great experience the perfect working of their engines, thus securing to our merchant steamers that marvellous power of performing long passages, sometimes at an enormous speed, with rarely a check or accident? Our naval engineers are liable to be changed from one ship to another, seldom finding the engines they have to work alike in two cases. Sometimes they are employed in ships that are rarely under steam, at others in a mastless vessel dependent on her engine-room for nearly all the work on board, having, perhaps, thirty different sets of engines.

These Officers may have the opportunity for visiting the numerous factories where engines and machinery are made for the Navy; but there being no established system of constructing engines for the Navy, it is impossible for them to be brought up to their work in the same way as the mercantile engineers.

To return to the executives. An executive naval Officer to be perfect must be indeed a marvel. He should combine wisdom with prudence, energy, and decision. He should possess nerve, coolness, fearlessness, and the strongest sense of honour. He should, of course, be thoroughly *au fait* in all that concerns the Navy; intimately acquainted with all the interior arrangements of his ship; readily adapting himself to changes, which in these days are numerous and intricate; fully conversant with the science of working and mode of using the guns and arms in action, whether on board ship, or with seamen on landing or other expeditions, having a commanding knowledge of all the steam and other machinery on board. He should be experienced as a seaman, an adept at handling his vessel under any and every circumstance, understanding modes of signalling and manners of manœuvring in fleets; he should be an able and trustworthy navigator, capable of managing his ship in dangerous waters with a free and firm hand—not so much with "caution" as with boldness and confidence, coupled with masterly knowledge. He should be experienced as a disciplinarian, must know sufficient of the law to qualify him to be an able magistrate, and to preside over courts-martial, naval and prize-courts. Above all he should be a sound diplomatist, able and ready to use his discretion, and accept responsibility on the most important questions, and this often as quite a junior Officer. The knowledge of foreign languages is most desirable if not actually necessary, and the power of writing good despatches very important.

No other service requires that its Officers should possess such numerous qualifications, and therefore naval Officers must be trained and selected for promotion with the greatest possible care, no expense being spared and every encouragement offered to induce them to put their whole mental power into the work of acquiring professional knowledge and ability.

The question now arises "How are we to get the nearest approach "to this description of a perfect Officer; how should his entry and "training be organized so as to produce the most satisfactory results?" To begin with, we cannot be too careful in our choice of the boys to be entered. The system of nominations and entry examinations should be such as to ensure none but those who promise well ever putting on naval uniform. Nominations being accorded only to young fellows who show themselves fitted for the Navy, high-spirited promising lads, with a sense of honour and goodwill that in manhood will make their country proud of them; and the examinations selecting from these those who are talented and industrious.

At the age of twelve it is barely possible to form a correct estimate on either of the above points. A well advanced boy at that age may be a dunce at fourteen, and *vice versâ;* we neither want to lose the boy who will be worth having at fourteen, nor do we want to keep the

youth who has been forced for his examination and proves worthless when two years older. We would, therefore, most strongly insist that it would be for the benefit of the Navy if cadets were entered two years later, between the ages of fourteen and fifteen; and then by a perfected system of issuing nominations, and arranging the examinations, ensure their being what we want, viz., boys physically and socially fitted for the Navy, and by nature practical mathematicians. A carefully devised examination comprising many subjects, but, with the exception of Latin and French, all of a practical nature; and if it is practicable with questions arranged especially for the occasion, and not from any given series of books would, we believe, ensure this.

It requires a mathematical mind to organize a fleet, to dispose of and manœuvre ships in an action so as to gain advantage over the enemy, also in order to perform all and any of the innumerable duties that fall to the share of the Officers of Her Majesty's ships, from rescuing and saving vessels from wreck or danger (such as the hauling off of Her Majesty's ship "Gorgon," after being stranded in the Bay of Monte Video, May 10th, 1844, by Captain Hotham and his Officers, a feat which will remain an everlasting testimony of the mathematical skill and perseverance of Englishmen) to the simple methods of hoisting weights in and out of a ship. All are mathematical applications of power which require skill in order to be efficiently worked, the secret being *economy of force;* waste of power, or the fact of not using it to the full of its advantage, may occasion the loss of an action or any other disaster. A boy who can handle a practical problem skilfully, whether in algebra, Euclid, or trigonometry, though it were quite strange to him, would probably, as a man, handle a ship under exceptional circumstances with equal skill. Both are, of course, the result of experience, and skill as a seaman might be obtained without the knowledge or study of mathematics; but the possession of this knowledge is of the greatest service in all the acquirements of a naval Officer, and it is probable that all real seamen have ingenious or mathematical minds, though themselves unconscious of possessing such a qualification.

To proceed then: enter boys who can pass the foregoing tests between the ages of fourteen and fifteen, all capital young fellows with the rudiments of mathematics well instilled into their composition; send them to a training ship or college for six months, there to learn how to apply their mathematical knowledge to naval subjects, at the same time giving them an introduction into the Navy, an opportunity of boating, bathing, and seeing what a man-of-war is, learning sea terms, and having free use of the ship's masts as part of their playground. After this send them to sea in training ships, of about 1,800 tons, for six or nine months, there to learn the manual of seamanship, namely, what a ship is, how rigged and worked, and all the minutiæ of detail in service fittings and arrangements. Examinations will take place at the end of each of these periods, at which the cadets will be awarded sea-time according to their merit, as on the present system. Having passed the final examination satisfactorily, a boy will be appointed to a sea-going ship, as midshipman, there to learn his duties

as a naval Officer, great care being taken that every opportunity be afforded him to study every branch of professional work. After completing three and a half to four years at sea (from the time of leaving the training ship), according to the amount of time gained by examinations, and provided that he is nineteen years of age, he will be required to qualify for the rank of Sub-Lieutenant on a system of instruction and examination similar to the present.

By this plan the periods of instruction in different subjects would be definitely divided; first, a good schooling in general mathematics and other school subjects, giving time to root itself in the boy's mind; second, a short period during which he learns to apply this knowledge to a practical purpose, namely, its use in sea-life; third, another short period, when his principal time is employed in learning the manual of a seaman's duty (this would be quickly mastered by boys of from fifteen to sixteen years of age, who were necessarily mathematically disposed); and, lastly, three and a half to four years in learning the duties of a naval Officer, everything else being made subordinate to this one requirement. A well-organized and strictly adhered-to system of bringing midshipmen up to learn their duty in charge of boats, decks, masts, and parties of men, and as they gained seniority, the duties of working the ship and batteries of guns, would secure this end; the midshipmen being constantly under instruction in such matters, and the time for school, only sufficient to enable them to keep up former knowledge. At present, on board a sea-going ship, school appears to be considered of the first importance, and indeed since the examination at Greenwich makes or mars promotion, it is only naturally so; but if boys were well grounded before entry, and lived in an atmosphere of practical mathematics from the age of fourteen and a half to nineteen or twenty, nine months' real study at college should prepare them for an examination equally as difficult as there is at present, and the results we believe would be even better. Anyhow, we should obtain a nearer approach to the required standard naval Officer than we are likely to do at present.

There is one other word to be said before we leave this part of an Officer's career. As a midshipman, and afterwards as a Sub-Lieutenant, professional ability should be carefully noted and reported to the Admiralty, and this should go a long way towards qualifying an Officer for early promotion to Lieutenant's rank. The present system of certificates is not sufficient to meet this end; it would be better if they were issued yearly and supplemented by fuller particulars as to ability shown by the Officer in his different duties, and then certified by the Commander or Senior Lieutenant and the Officer of the watch, or Lieutenant who has had most to do with the young Officer, as well as by the Captain of the ship. This we mention because it often occurs that the Captain has not the opportunity of forming a good estimate of the younger Officers. They may be a very short time with him, and they are probably on their mettle when he sees them at work.

In the foregoing an alteration is proposed in the present system, as far as the age of entry and the speciality of the training of cadets and midshipmen is concerned: after this period it would be difficult to

improve on the general principles of training that are now working themselves into order, and that made such grand advances when Greenwich College and the torpedo schools were instituted. For junior Sub-Lieutenants, the gunnery and college courses are admirable, and tend to bring our promising men to the front. As junior Lieutenants the short course of gunnery and torpedo, and a term at college, should complete an Officer in the rudiments of professional qualifications.

The days of Gunnery-Lieutenants are undoubtedly numbered; all Lieutenants should be fully acquainted with the drills and duties on board, and the only special men will be a few who have shown great ability, and will undergo a long and comprehensive training to qualify them as gunnery and perhaps torpedo Staff Officers.

The period of service as a Lieutenant is the real test of an Officer's worth; it is in this grade that he should prove himself worthy of advancement or otherwise. Men who have shown neither ability nor wish to work, must be content to make way for others. Men who are anxious to do well, but who are not naturally talented, must also give way to the requirements of the Navy; for we must have able men, who are in every way fit to command, and to act promptly and judiciously under the most trying and difficult circumstances. Hard-working Officers, who fall short in these requirements, should be most carefully treated, and it is desirable that their otherwise good services be rewarded as adequately as possible. To promote some of these, and to give them responsible appointments that they are not fit to hold, would be doing an injustice to them and to the nation, but they may be constantly employed, and eventually retired on a very liberal scale. The retirement scheme of March, 1870, was admirable in this respect; the amount increased with the length of service in any rank, and therefore an Officer who had served well but who had not been so prosperous in his career as his more brilliant colleagues, is well provided for, whereas those Officers who advance rapidly receive rank, but are not induced to leave a service (that appreciates and wishes to retain them) by offers of good retirement. The system of promotion should be founded on these principles: encourage the ablest Officers to put their whole energies into their work, and so mount the scale as quickly as possible. Encourage those less gifted to work well and so earn honours next to the first. Encourage Officers of average ability to form the backbone of the Service, holding out the certainty that their services will be adequately rewarded, if not by promotion, at least by a liberal retirement; encourage Officers of less value to serve for similar retirements; and let all others who are more or less a hindrance, and have in fact mistaken their profession, understand that they had better make way for better men.

This may seem very arbitrary, but with the interests of the Navy and the honour of the country at heart, the service must unflinchingly resort to a system of this kind. The naval members of such a permanent council for naval administration as I advocated in Part I, could make the selection of executive Officers for promotion and advancement a part of their special duty, and this able and influential

body would doubtless do justice to all Officers. Captain Needham, R.M.A., speaking of the French Admiralty Council, says, "On the one "hand it advises on all measures relating to the general administra- "tion of the Navy and colonies; on the other hand, in its character "of an impartial judge of the services and merits of every Officer, it "prepares each year the lists by which promotion in the several "branches of the service is governed."[1] We have here a lead that it would be well to follow.

By careful entry, effective training, and then just selection, our higher ranks should be supplied with the most accomplished seamen and Officers that the world possesses. For the last twenty years naval Officers have been in a transition state, seamanship has been neglected for what is erroneously called higher science, and the rapid introduction of one improvement after another in ships, guns, and arms, has rendered any systematic training most difficult. Hence, they have lost in the principal essential, "*seamanship*," and have gained comparatively little in other matters, owing to the innumerable and rapid changes.

Let us hope that the young Officers now entering, and about to enter, may reap the full advantage of former experience, that they will find their career more clearly laid out for them; the training more suited to the requirements, and every facility given them for obtaining the maximum of professional knowledge; for it seems impossible that changes in future should be so great and constant as they have been of late.

The Navigating Branch.—The Admiralty circular, dated March 27th, 1877, on the abolition of this as a separate branch of the Navy, brings to an end the question which has for a long time occupied the thoughts of naval authorities; that it is a wise decision is unquestionable, for it is impossible in these days to keep able and experienced men in a low grade of rank for long periods, and so let the service benefit by them without offering an equivalent return. The "Master" of former days was an experienced old seaman, who often had more knowledge of the sea than anyone on board, and was to be fully relied upon; but of late the Navigating Lieutenants have been much younger men, and sometimes of even less experience than Lieutenants of their own seniority. Besides this, boys entered for the navigating branch were bound to become Navigating Lieutenants if they remained in the service, whether they had taste and ability for those duties or not; whereas, choosing men for navigating duties from the Lieutenants and Sub-Lieutenants list, you are sure to secure the services of many Officers, who show natural talent for navigating and piloting ships; we may, therefore, rest assured that these Officers are perfectly capable of relieving the Navigating Lieutenants and Sub-Lieutenants, and of performing their duties with equal skill.

We next come to the question of how to provide a proper substitute for the admirable and highly experienced men constituting our present list of Staff Commanders. These Officers resemble the "Masters" of old time; they have spent their lives in the performance of one par-

[1] See "Journal," Vol. xxi, No. 91, p. 856.

ticular duty, gaining immense experience and ability, and are consequently invaluable. We shall undoubtedly lose by the abolition of the navigating branch in this one respect; it will be difficult to find substitutes for them, wherever they have been employed, especially in the case of flag ships, where the navigating Officer is expected to do squadron work, and is in a way responsible for all the ships that are in company. This last appears to be the sole case in which a Commander, who has been promoted for his services as a navigator, might still be employed in that capacity; he should then be appointed on the Admiral's staff (in addition to the "Lieutenant for navigating "duties," belonging to the ship), to conduct all squadron work, carrying out the Admiral's wishes on all questions of navigation, evolution, taking up berths in harbour, surveying stores, &c. It will not be found possible to employ Commanders for navigating duties on board other ships; for it is only right that they should be entitled to commands of their own, either of surveying vessels, if fitted for it, or others, and so return to their regular duties in the same manner as Gunnery Lieutenants when promoted.

Engineer Officers.—The next Officers of executive importance in the navy are the engineers; they are classed with the civilians, but their duties are more nearly allied to the executives.

The Chief Engineers now in the Navy, amongst whom we find many able men, all entered when steam was an auxiliary, and only considered valuable as such. These Officers were not particularly benefited by having been obliged to serve many tedious years in the junior ranks; and now, before they are of sufficient seniority to be appointed to the most responsible posts, in many cases their age is such that energy and abilities are alike impaired, and they are, with few exceptions. unequal to the task. Again, these same Officers were advanced in relative rank, and in receipt of higher rates of pay, with the increasing importance of machinery, but the whole class has not kept pace with the requirements of the times; we want our engineers not only to work the ship's propelling engines, but also to materially assist us in the building of ships, the construction of engines and machinery, and on board ship to be capable of managing and superintending all the intricacies of gun-machinery, water-tight compartments, and pumps, and in fact the good repair of every part of the vessel that comes out of a factory.

Plans are now being tried for improving the class of engineers, but great difficulty is found in keeping men who prove themselves valuable, because there is such a demand in the country for good engineers, that students who promise well are bought out of the Service, or leave it, in hopes of getting more profitable employment. Valuable men, no doubt, command a very high rate of pay—or other advantages—and the country must be ready to give it to them. The corps would much benefit by the abolition of promotion by seniority, and the institution of promotion almost entirely by selection. The system of promoting Officers, capable or otherwise, to the higher ranks and rates of pay, is most injurious to the Service; let every rank be filled by selection, and let this selection be the result partly of

examination, partly of strict inquiry and recommendation. By these means there would be a better chance of retaining the services of good Officers, and these would be rapidly brought to the front. Earlier in this part of the essay, we mentioned, among the difficulties that naval engineers have to contend with, "the enormous variety of engines "they have to work"; this can only be overcome by Government taking in hand the manufacture of machinery for the Royal Navy, and establishing an enormous factory which will provide engines for every class of war-vessels, and at the same time be a school in which our engineers will be brought up to and perfected in their work. Woolwich Arsenal produces the finest guns in the world; such another Government Institution should produce the best engines in the world. Contractors have failed so often of late, in the engines they have put into men-of-war, that they can have no reason for expecting the country to retain full faith in them. The establishment of such a factory would, therefore, be a wise and popular step, as well as one of inestimable benefit to the Navy, both in furnishing engines more uniform in character, and in providing for naval engineers a school of instruction.

If we look across the Channel we may learn a good lesson on the subject of engineers; the French have been much more prudent than ourselves. From the beginning they have employed very few Officers, and have trained their *mécaniciens de la flotte* (men in the position of our engine-room artificers) to take charge of the engines of nearly all ships, there only being an Officer of the maritime engineers (*mécaniciens principaux*) on board the flagships and other large and important vessels; the whole number being fifty, namely, two *mécaniciens en chef*, ranking with Commanders, eight *mécaniciens principaux de* 1*re classe*, and forty *de* 2*ième classe*, ranking with Lieutenants and *enseigns de vaisseau;* in addition to these, and attached to the Navy, they have the *corps du génie maritime;* who, while occasionally being employed with the fleet, have the superintendence of everything that concerns the designing, building, and repairing of vessels of war; men of superior ability, recruited from *l'Ecole Polytechnique*, and rising to a rank and rate of pay corresponding with the higher Officers of the Navy.

We are at present employing a most useful class of men, namely, the engine-room artificers, and with due care they may be trained to fulfil all the engine-room duties on the French system. But, unfortunately for the Navy and for the Officers themselves, we find an overstocked list of engineers, valuable in their way, but too good for ordinary engine-room work, and with few exceptions, not of the requisite training and experience to perform the higher duties of the department. We want well-trained engine-room artificers and—comparatively—a few exceedingly skilful engineers; of the former we have already a large number, which, however (if they are intended to take charge of the engine-room), will require to be increased, and to obtain the latter at the requisite age, we must begin anew.

Should the reforms now under trial for the improvement of this department fail, there is another plan which might be tried: it would

be easier to obtain the services of a higher class of men, if they were exempted from the drudgery of service in the lower ranks, and this might be done if Government were to enter men of good position, who, during ten years' experience, had proved themselves thoroughly able and skilful as civil as well as marine engineers, who, after one year's qualifying in a naval dockyard or factory, would be placed on board a ship in charge of all the engineer department, receiving high rank and pay. In this manner a school of men might be started, who, at a future time, would vie with executives in the question of importance to the Navy.

Some plan might be devised of engaging the services of these gentlemen for stated periods.. They would look forward to rising in importance according to the ability they showed, until their position nearly approached that of the first Officers of the Navy; and surely no one would begrudge it to them, if they were gentlemen of unquestionable skill and experience in the department of all others the most important to the well-being of our ships of war.

We ought to have the best engineers to construct and work the engines of, and to design, build, and repair our ships; and the best of executives to command, manœuvre, and fight them.

It will be found difficult to bring up and educate engineers of a higher class for the Navy, and to keep the ablest of the men we go to such an enormous expense to train; whereas, if *we* do not train them, we can afford them much higher rates of pay when fully trained. Should this plan be ever entertained, the present engineers will have to be gradually pensioned off, after the manner of the navigating branch; the ablest men who are not too advanced in age being retained, and perhaps placed on the new footing.

Paymaster Branch.—We will pass over the remainder of the civilians of the Navy, with only a few words on the commissariat, as some ideas have occasionally been put forward of abolishing paymasters. We shall never be able to do without this valuable and important branch, but it might be an economy to the Service, and a benefit to both the Navy and the Officers it assisted, if a few paymasters' commissions were yearly given to executives who had shown themselves to be more fitted for office-work than for a seaman's duty, and could pass a requisite examination: fewer entries would then have to be made in the paymaster's direct line, and the whole branch would eventually become of more value as combatants, for they should certainly be required to assist in executive duties in times of emergency, when every Officer and man on board must make himself, to a certain extent, useful as a combatant. Officers of this branch have, on many occasions, proved themselves by no means behindhand in daring and aptitude for any work that may be required of them; let their use on such occasions be encouraged, and their value will be materially increased. In the office they are invaluable; we *must* have office-men, but let us hope that "instructions, and regulations," and other work they may have to do, may be kept as simple in form as possible, and all avoidable paper-work be dispensed with.

Employment of Officers, and their Leave of Absence.—Speaking

generally, the system of employment for Officers is satisfactory: to find employment for them in time of peace will always be a difficulty, but with the help of the Royal Naval College, and the Gunnery and Torpedo schools, work is found for some of those who cannot be given sea-going appointments, and, apart from this, a few months on shore does no harm to an active-minded man; there are plenty of subjects for him to study, and plenty of things for him to see, that will enlarge his mind, and give him insight into what is going on in the world; thereby strengthening his common sense and benefiting him generally. The continual service at sea, which is looked upon by many as so important, tends to keep an Officer from ventilating his mind, and narrows it into a groove, which detracts from his general ability.

As regards leave, let it be an understood thing in the Service, as it is now under some Admirals, that Officers abroad be encouraged to visit all places of note and interest within reach of their ship; the necessary amount of leave being freely given. A system of one month's leave on full pay at home, for each year's service abroad, or otherwise, would be hailed by the Service as a great boon. Admiralty liberality does much for the good name of the Service, the reverse does much harm; to keep our best Officers and men, we must look after their wants, and humour them; so all liberal acts are worthy of consideration.

Seamen of the Royal Navy.—The organization of this portion of our naval service is on a more satisfactory footing now than it has ever been before. But as all things are slow in perfecting themselves, and seldom attain real perfection, so there are points where alterations might facilitate matters, and render the training of men—so as to qualify them as able seamen and gunners—less laborious and expensive.

At present (quoting from an instructive lecture delivered by Captain J. C. Wilson, R.N.)[1] we have an average yearly entry of 2,727 boys (nominally 3,000), and this furnishes the Navy with seamen as follows: 5,104 petty officers and leading seamen; 7,513 A.B.'s; and 6,416 ordinary seamen; in all, 18,673, of which he says 18,050 are continual service men.

The training of boys is admirable in nearly every respect; the training of seamen is satisfactory, and, considering the amount required of them, petty officers, though often too young, are as good as can be expected. Taken as a whole, the present system works capitally, and its principles should be strongly adhered to.

Now as regards the entry, the late Mr. W. S. Lindsay, in some valuable articles[2] on our maritime defences, &c., advocates the desirability of the Royal Navy so acting in harmony with the mercantile marine as to secure reserves of seamen, and wishes Government to undertake the original training of 6,000 boys, on the plan of the Industrial and Reformatory school vessels; then to have the choice of a few who would join the Royal Navy as boys, the remainder being bound to serve from the age of sixteen to twenty as apprentices in the merchant service, and from twenty to twenty-three as seamen in the Royal Navy;

[1] See "Journal" of the Institution, Vol. xix, No. 83, p. 604.

[2] "Nautical Magazine," August—December, 1876.

after which age they would have the choice of either service as their employment. He thinks that this would admit of naval training-ships being dispensed with, and would provide able seamen for all the country's wants, imperial and mercantile. It is undoubtedly important to the Royal Navy that the merchant service be well provided with able seamen, from whence to draw the Royal Naval Reserves, and the system of bringing boys up to sea life, and to be under discipline in the manner proposed, would be alike beneficial to the Government and to ship-owners. Let Mr. Lindsay's proposition be met half-way, and Government further endow the admirable institutions of school-vessels, and then have the choice of boys as they attain the age of sixteen; such boys passing one year in the Royal Naval training ships instead of two; other boys (to complete the number required) being entered and trained as at present. It would be a dangerous experiment intermingling the two services to any great extent, and the plan of all apprentices, after four years in the merchant service, being sent for three years into the Royal Navy would never answer, for we should find it fatal to the discipline of the latter. Difficulty enough is experienced in controlling the ordinary seamen at this age, entered on the present system, and this would be greatly increased if the men had been under different and less strict discipline for the four previous years.

We have enough seamen perhaps for our present requirements; but it would not be too much to ask of the British tax-payer, if we put down the number of boys yearly to be sent to sea from the home training ships as 3,000 (that is an original yearly entry of about 3,500), this would bring the total number of seamen proper up to 20,000, which is ample for our Navy in times of neutrality or peace. Looking at the manner in which the 60,000 persons provided for in the Navy Estimates is made up, it is surprising to find how few are actual seamen, for of the 29,000 mentioned as the number of petty officers and seamen, about 4,000 are stokers, 3,000 artificers, and 3,400 domestics, leaving only 18,600 seamen proper. This is the only section that requires special and elaborate training (and it should be increased to 20,000 men).

It seems really absurd to compare this number with the legions of men trained for the principal defence of foreign countries; surely we can afford to perfect our seamen, whatever the individual expense. The most important of all training is that of seamanship, that is, the whole work of a seaman at sea, on board ship, and in boats. Once let a man prove himself a good seaman, and you will find that he adapts himself to every kind of work that requires activity, coolness, and courage, ingenuity, handiness, and neatness; our smartest petty officers and upper yard-men make the best gunners; they are generally men who take pride in doing everything well, from keeping their dress neat, and the guns and gear in their charge in perfect order, to working their guns with precision and smartness, and being exceptionally ready and expert in all work aloft, whatever the danger or difficulty. Such men are not to be matched in the world; in addition to being activity itself, their whole training tends to render them fearless,

generous, and fit to cope with every possible difficulty. For a top-gallant yard-man on a stormy night (especially when his ship has to keep station in a squadron) is often aloft and alone at his work, contending with the elements at the momentary risk of his life. Such is an example of a seaman's training and employment. The greater number of these splendid fellows we can get the better for the Navy. We should therefore give every one of the youths entered the opportunity of proving that he possesses the admirable qualities of a true seaman. Drill and work need not be made a labour to any but the lazy (who should be made to make up their share of work by doing duty in extra hours). But drill with sails and arms is part of a man-of-war's man's life, and is to him the "food of efficiency." Let seamanship be the first and special requirement of all the sailors of the Royal Navy, taught in all ships, and particularly so in sailing squadrons of instruction.

Following this comes the training in gunnery. At the beginning of this century the science of gunnery was unknown. In 1804, the corps of Royal Marine Artillery was instituted, and for many years supplied the only trained gunners on board ship. About forty-six years ago, the Naval School of Gunnery was formed, and the "Excellent" has since been a permanent establishment, reinforced some years afterwards by the "Cambridge," for the accommodation of Plymouth men. These schools have turned out men who have proved themselves more fitted for working guns on board ship than the Royal Marine Artillery men, principally owing to their having been obliged to qualify as able seamen before being allowed to go through the course of gunnery instruction.

When men were entered from the shore as novices, and from the merchant service, it was necessary that a special training should be given, in order to ensure some of them being capable of executing the gunnery duties, and giving instruction in drills, &c.; but now that every man is entered and trained from boyhood to his duties in the Navy, special gunnery training might be dispensed with, save in the case of a few, who have shown great aptitude for gunnery duties, who should be allowed to qualify as instructors.

The present school of gunnery has its weaknesses; it inaugurates a system of making a distinction which should not exist, for now-a-days every seaman should be a gunner, and not only a special class of men; and from boyhood a seaman in the Royal Navy should look upon a rifle (and its sword bayonet) as his weapon, and learn to be as free in handling it as a sportsman is his fowling-piece. Again, when we think that the whole science of gunnery resolves itself into loading and laying a gun quickly, and firing it accurately, surely any intelligent man, well under discipline, can learn his duties without much difficulty, how much more easily should efficiency be attained if, from their entry, seamen were brought up to the general principles of gunnery.

A drawback to systematic training appears to exist in the want of uniformity in the disposal of seamen, which, under present circumstances, is unavoidable, but we would suggest that by the establishment of naval barracks in our principal dockyards, this difficulty

would be overcome. Barracks for seamen have been advocated by nearly every writer and lecturer on naval subjects, and if it were not for the expense of the buildings, we should undoubtedly have had them long ago. There appears only one thing against their being established, and that is the feeling that it might be the thin edge of the wedge for opening a way towards the recognition of seamen's and Officers' wives by the Navy: but this would never be thought of, if the barracks were built *in* the dockyards, and arrangements for leave conducted in the same manner as on board Her Majesty's ship "Excellent."

Training ships and brigs are, undoubtedly, best for boys; but after that part of their training is over, let them, on all occasions, return to the barracks, and there undergo instruction in all branches of gunnery and seamanship, as well as forming working parties in the dockyard; moving vessels and other duties of the same nature (now performed by the artificers of the dockyard at a great loss of their time). All the men should be placed on a regular rolster and drafted off to ships as required; those about to be sent to any new class, or experimental ship, being specially trained to the working of their particular guns. Much is taught on board the present gunnery ships that is not necessary for *all* seamen. It would be better to bring our men up to master what is really of value to them, simplifying all drills to the last point, and making all our able seamen perfect in them. What is the good of teaching parade movements to blue-jackets, because they happen to be armed with rifles? There should be a practical field exercise for the Navy free from all such unnecessary complications. Let well-disciplined men be perfect in the use of their arms, and the knowledge of how to move in fours and in quarter column, and how to form line, and to skirmish is all that will ever be required of them as part of a naval brigade on active service. The waste of time on board ship in tedious barrack-yard goose-step, or squad drills, is a curse to the Navy; as though we had not enough useful work for seamen to learn. Regiments of infantry have nothing else to do but to perfect their men in one subject; complications are made in order to give steadiness and exercise ingenuity, and manœuvres to prove efficiency on parade; but no parade movements would be used on the field of battle. Men in the Navy should be all riflemen, in addition they must be ship-artillerymen and swordsmen, but above all they must be seamen; the sole aim of all instruction being readiness for action, accident, or relief of disaster.

Let there be an able gunnery staff (provided with every facility for teaching) at each naval barracks, and let every seaman in the Navy be brought up as a gunner and rifleman, rifles being supplied to the men and kept by them for the time of their service (as with the marines): let it be an understood thing, that during the six months or so which every man would have in barracks after a three years' commission, he should be fully instructed in all changes that may have been made in gunnery, and thoroughly prepared for the ship he is about to join.

In the first three years of service as ordinary seamen, regulations

should admit of their having at least one year in ships set apart for special training in seamanship; but as these men are required in the Service, to fill up our ships' companies, we cannot afford them a longer period. Able seamen and gunners form the backbone of our Navy; these men, after careful training, should be encouraged to qualify for petty officers, and these again to work their way on to become warrant officers, if found deserving and capable of doing the duties.

The late circular, granting an increase of pay to men who re-engage for an additional ten years, is undoubtedly good policy; but in these times, when seamen calculate their prospects so closely, we shall still have difficulty in getting back some of our steadiest men, for so many opportunities are open to really good men, in the railway companies, police, and fire brigades, where, if they behave well, they get more than compensated for the loss of their naval pay and pension. The late First Lord of the Admiralty, in a speech on the Navy Estimates (March 14th, 1877), put the loss of ten years' men down as from 25 to 35 per cent.; he stated, in the same speech, that of 100 boys entered, 88 became ordinary seamen, and 40 completed ten years' service.

We want to retain good men and to get rid of the worthless, and should, therefore, begin by getting picked boys, carefully weeding out those unfitted for the Service, before too much has been expended on their training. We should then facilitate the exit of men who turn out badly and prove lazy, good-for-nothing fellows, or insubordinate, and uncontrollable. A practice is supposed to exist of men who wish to get off their engagement and leave the Service, purposely committing offences so as to be discharged as useless or incorrigible; this might easily be prevented by trying by court-martial, and committing all really worthless characters to imprisonment, not exceeding one year, before discharge from the Navy. The more we prove to our seamen that undeserving men will not be tolerated, or allowed to remain in the Service, the more certain we are of getting and retaining respectable and able men. It often occurs that a dozen young scoundrels give more trouble than all the rest of the ship's company, annoy both Officers and petty officers, and are a continual worry and bother, earning neither their food nor pay, and always under punishment. At one time the cat kept such men in order, but now it should be the fear of imprisonment together with discharge. Drills should be regular, and in all cases repeated if not satisfactory, but we should guard against giving unnecessary work. We should make the comforts of our men one of our first considerations, encouraging cheerfulness and content in all the duties a seaman has to perform.

Good men know well enough when duty is required of them, and will never shirk an atom of it; for no one faces dangers, difficulties, and trouble with less depression than a true sailor, and no one is by nature more prone to work willingly and cheerfully than men-of-war's men, when they are under good discipline and *well cared for*.

The denomination of "blue-jacket," comprises not only the seaman proper, but every other person that wears the uniform. Stokers, artificers, and carpenters all come under the general term; as a rule

we find these men steady, respectable, and quite equal to the work they have to do. Stokers are subject to much the same discipline and duties whether they are on board a merchant ship or man-of-war, we shall, therefore, never find great difficulty in recruiting their numbers when required. Artificers, carpenters, and other special branches of the Navy could also be augmented with equal facility.

The Royal Marines.—We do not hold that the presence of the marine force is necessary for the preservation of discipline and the upholding of authority on board men-of-war. But there are military duties, such as guards, escorts, sentries, and servants to Officers, not by nature readily, or well performed by seamen, but which are exactly suited to the Royal Marines. We trust that a seaman's real duty will be ever held of the first importance, and that all attempts to turn him into a soldier will utterly fail.

The value of marines in assisting the ordinary work on board ship is incalculable, for it is generally recognised that they are, if anything, better men at hauling on ropes than the lighter and more active blue-jackets. All the men on board are not required for duty aloft, therefore the marines, who make the best deck hands, have plenty of employment.

The Royal Marine Light Infantry is a service of infinite value to the Navy; popular and easily recruited, it forms our first body of reserves, so it would be well to add to the strength of this important corps, and arrange that, in the event of war, the percentage of marines on board ship should be increased (see Table VI, page 495), in order that our usual number of trained seamen could man a larger fleet, fewer being required in each vessel.

The Royal Marine Artillery.—This corps, one of the finest and most intellectual bodies of men in the United Kingdom, was formed at the beginning of the present century as a "corps of naval gunners," and was of the greatest possible value as such, until seamen so advanced in intellect and training as to excel them in naval gun practice. In fact, the want, to supply which they were originally intended, no longer exists, and we find that this admirably trained and valuable set of men are required on board ship to do little more than the duties of Light Infantry Marines. It seems impossible that the Royal Marine Artillery should exist on its present footing much longer. It will either have to be done away with or else put to some other use. It would certainly be a great pity if such an able body was disbanded, and its services lost to the country. As naval artillerymen their day is over, but surely we can find other employment which will be equally suited to their intelligence and superior training.

We want a steady, intellectual body of men to master and conduct torpedo affairs on board ship, and at our colonial ports; men who have been brought up to the work and who can be fully relied upon: both Officers and men forming a complete and serviceable corps. It appears that the present Royal Marine Artillery is, in every respect, suited for this duty, and that by substituting for the duties and name of artilleryman that of engineers, or miners, a most perfect and reliable corps would, in a few months, be ready to undertake all

torpedo duties, and eventually become a valuable and highly scientific body of torpedoists. "Royal Marine Engineers" would be distributed among the fleet in the same manner as Royal Marine Artillerymen are at present, doing the same duties, only substituting torpedo work for artillery. By these means, even the smallest vessels would carry two or three torpedo men.

Officers of the present Royal Marine Artillery would be required to master the whole science and detail of torpedo work, and would be appointed to the fleet for torpedo duties; and if this number of Officers was not found sufficient for the purpose, some of the Officers of the Royal Marine Light Infantry might be encouraged to qualify in torpedo instruction, and so assist in torpedo duties, receiving increase of pay according to their qualifications. We are now instructing seamen as torpedoists, but it is impossible to give them sound knowledge in their business as such, and at the same time require of them the duties of a man-of-war's man. They do not commence their training until they are A.B.'s, and even then, if they were specially instructed to the neglect of other professional acquirements, their time of service would probably expire three or four years after they have attained sufficient knowledge to be of any practical use.

An attempt has been made to bring in the same argument on the torpedo question as that raised on the question of naval gunnery some years ago: it was then said that seamen were not capable of being gunners, and they have since undoubtedly proved that they are at least equally capable with the Royal Marine Artillery. But this does not really apply to torpedoists. If it were necessary that every seaman studied the art and had to work torpedoes, by all means let them all qualify; but this is not the case. Every seaman must be a gunner, but only a few men on board each ship are required for torpedo work. Seamen would naturally be of great assistance in torpedo boat work, but the manipulation, handling, and charge of these dangerous weapons would be infinitely safer, and torpedoes more serviceable, if entirely under the control and management of a special corps of highly-trained and intellectual men, such as we should command if we employed the Royal Marine Artillery for this service.

The authorities at the torpedo schools, surrounded as they are by scholars ardent as zealous, are not inclined to admit the blue-jackets' shortcomings; but let them transfer themselves to a corvette on some distant station, and ask to see the men who are qualified as torpedoists! *One* may be found who has passed the examinations, but he is perhaps at the same time coxswain of a cutter, second captain of a top, and captain of a 64-pound gun; how much time or brain-work can he employ in his duty as a torpedo man? There is little doubt we ought to have a special corps, and the Royal Marine Artillery are entirely equal to the occasion; their barracks at Eastney are admirably suited for the required purpose, and Langston Harbour is just the place for experiments and instruction. In this manner our object would be gained, and we should have Officers and men fully conversant with every description of torpedo, and capable of arranging defences for colonial ports, of conducting all the ways and means of clearing

the enemy's channels and of frustrating offensive attacks, as well as of working the torpedoes on board ship.

Reserve Forces.—The first reserve for manning our fleets are the seamen from the Coast Guard and the Royal Marines (of both corps) not employed at sea in time of peace. Of the former we have about 4,000 all admirable and well-trained seamen and gunners, but of these it would be advisable to leave one-half for duties that may be required on the coast, only to be called out for service when most urgently required. Of the latter we should have from 8,000 to 12,000, half of whom, in case of war, would at once be sent to fill up complements; the remainder held in readiness to supply men as needed.

Our next resource is in the seamen of the Royal Naval Reserve. The qualifications most necessary for this force are good character, experience as seamen, strength, and activity. If merchant seamen were entered as apprentices and thoroughly trained we should have no difficulty in getting 20,000 of them to form this reserve, which would perfectly fulfil all our wants and provide us with a truly splendid body of men in time of need. The late Mr. W. S. Lindsay writing on this subject,[1] speaks of the failure of good mercantile seamen, and of the large number of foreigners employed, mostly inferior men; he gives the number of able seamen in both the naval and mercantile services as 40,000, and very rightly insists that we ought to have at least 100,000. His plan of obtaining able men in great numbers is admirable, and appears simple enough if enforced by law. It is that all ships should carry from one to four apprentices, according to their tonnage, lads serving as such for four years. This (according to his calculations) would provide about 30,000 of the rising young seamen, and in a few years amply supply all wants. Mr. Lindsay thinks that by remunerating shipowners, who may thus be forced to employ more apprentices than they require, the system would be popular as well as beneficial. Entering boys and ordinary seamen, and so filling the ships with half-and-half men, not only induces apprentices to break their engagement and desert, but is a practice which Mr. Lindsay condemns as a terrible evil; he says, "I conscientiously believe that "far more vessels are lost, and that far more lives are sacrificed "through incompetent and untrained seamen, than through unsea-"worthy ships."

We should probably find all difficulties vanish if, under the control of a Council and Minister of State for Maritime Affairs, the training of merchant seamen were treated as a national question. It affects alike the safety of our merchant shipping. the preservation of the lives of our seafaring population, and the formation of reserves for our standing Navy.

The Royal Commission of 1859, on "Manning the Navy," arranged for 20,000 Royal Naval Reserve and about 20,000 men of other forces as reinforcements; of these we have at present about 18,000 Royal Naval Reserve and 1,000 Naval Coast Volunteers; the remainder are not forthcoming. The Royal Naval Reserve men are in two classes,

[1] "Nautical Magazine," August—December, 1876.

but the second class should certainly be abolished as soon as we can get sufficient first-class men to complete the number; and then as the second line of reserve we should find 20,000 of the best seamen the merchant navy can produce, sufficient to recruit all our extreme wants at sea, and about 1,500 gunners, Royal Naval Artillery Volunteers, would be a valuable addition to our Coast Defence Force.

The present system of training reserve men answers admirably, and could not be improved upon; for there is great difference in the training necessary for such men and that required for those who man our ships in peace time. In the regular Navy we must have absolute obedience and strict discipline, continual drills and evolutions which appear unnecessary and tedious to those who do not grasp the importance of being always ready for any emergency. Nevertheless this importance must not be lost sight of; our ships are, and must always be, prepared and ready for battle, or any other service, at perhaps only an hour's notice. The difficulty, then, is to keep our men up to this extreme pitch of readiness, and still to preserve order, contentment, and cheerfulness in our fleets. On the other hand, the Royal Naval Reserve would only be employed in time of war, when men's minds would be fully occupied, and every exertion, both mental and bodily, would be called into action. If we can ensure obtaining a fine body of respectable men in those times, we need not look for perfection in drills, but may be sure that before being called upon to fight their ship, they will have made themselves masters of all that is actually necessary, as a gun-number, and putting manual power, intelligence, and bravery into their work, will prove of value almost equivalent to that of our regular highly-trained men-of-war's men.

As a last reserve we have in the country a large number of men who have served in the Royal Navy; and without the necessity of retaining our hold on them by a pension, the services of many of them could be obtained if England were really in danger by the offer of a bounty and re-entry with original ratings and good pay for such periods as might be required. A short service pension would be only an inducement to ten years' men to quit the Navy.

Before concluding this part of our subject, we will enumerate its salient points, and then consider the distribution of our seamen, &c.

The first question of importance in the organization of a powerful and economic Imperial Naval Force, is the satisfactory entry and training of our Officers, and the selection and advancement of those best fitted for the duties of the higher ranks; more has been said on the subject of the executive and engineer Officers than on other branches of the profession.

The entry of naval cadets at a later age, the training of junior executives, the institution of a central factory under Government for the manufacture of engines for the Royal Navy, and for supplying a school of training and instruction for our engineers, are the points most dwelt upon. Next, as regards the entry, training, and employment of seamen, barracks have been strongly recommended, principally with a view to establishing these matters on a more satisfactory footing. Simplification of all gun and small arm drills is insisted

upon, more general instruction being given and all specialities avoided. The aim should be to perfect our men as *seamen*, gunners, rifle, and cutlass men; the former standing first in importance, since seamanship exercises all that makes a man able and handy for any sort of work, especially the fighting and management of guns.

The Royal Marine Light Infantry is considered a most valuable force, and looked upon as the first reinforcement for the Navy in time of need. The Royal Marine Artillery are spoken of as being admirably adapted for torpedo duties, and the change in the name and employment of this corps is strongly advocated.

The Royal Naval Reserve is spoken of as capable of improvement under new laws for the obtaining and training of able seamen in the mercantile marine, and it is considered that 20,000 first-class reserve men would be ample for all requirements.

On the Distribution of Officers and Ships' Companies in time of Peace and War.—The principal difficulty here is the disposal of seamen proper, so as to admit of their being efficiently trained. Where great numbers are required this is almost an impossibility, unless large squadrons of instruction are continually and systematically employed; but excluding the able seamen we have only about 8,000 men in need of such training; and nearly all these can be employed, if we arrange that the proportion of seamen on board each ship be larger in time of peace and reduced in time of war, the vacancies being filled by marines and reserve men. (See Tables VI and VII.)

Table V gives the probable peace and war strength of our fleets.

TABLE V.—*Proposed Peace and War Strength of our Fleet.*

Description of vessels composing the fleets.		Average complement of men.	Number of ships in time of peace.		Number of ships in time of war.	
Sea-going iron-clads	1st class	600	4	12	15	40
	2nd class	450	8		25	
Cruizers	Frigates	500	8	103	10	127
	Corvettes	300	9		12	
	Ditto	200	12		15	
	Sloops	150	12		20	
	Ditto	100	40		40	
	Gunboats	50	22		30	
Coast defence vessels	Ironclads	400*	10*	30	10	30
	Ditto	200*	20*		20	
	Gunboats	30	10		50	
Sea-going training ships		400	6		0	
Troop-ships		200	10		20	
Mercantile armed cruizers		200	0		50	

* Coast defence vessels that have half complements in time of peace.

TABLE VI.—*Distribution of the different Classes of Officers and Men composing the Crews of Her Majesty's Ships in times of Peace and War, showing the percentage of each Class on board Vessels to be employed on different Services.*

Classes of Officers and men.	Peace establishment.					War establishment.				
	Iron-clads.	Cruizers.	Home and Colonial coast defence ships.	Troop-ships.	Sea-going training ships.	Iron-clads.	Cruizers.	Home and Colonial coast defence ships.	Troop-ships.	Mercantile armed cruizers.
Officers Royal Navy (all branches) ...	9	9	10	10	8	8	8	6	5	2
Officers, R.N.R. and R.N.A.V.	..	..	..	..	..	..	..	2	5	6
Petty Officers and A.B's., Royal Navy	22	28	30	35	20	17	27			
Other seamen and boys, R.N.	25	30	..	..	50	9	23			
Petty Officers and seamen, C.G.	..	..	..	..	..	..	..	18		
Seamen, Royal Naval Reserve, and gunners, R.N.A.V.	..	..	..	..	..	15	5	10	30	60
Stokers, Royal Navy.....	10	5	30	25	..	12	6	10	10	
Stokers from merchant service	..	..	..	..	..	..	..	10	15	20
Artificers and tradesmen, R.N.....	8	7	10	5	6	8	8	6	5	
Ditto, merchant service	..	..	..	..	..	..	..	4	..	3
Domestics, band, &c.....	7	7	10	15	6	7	7	10	15	7
Royal Marine Light Infantry	15	12	6	10	10	20	14	20	15	
Royal Marine Engineers (Torpedo Service).....	4	2	4	..	..	4	2	4	..	2

TABLE VII.—*Numbers of Officers and Men required to man Fleets in times of Peace and War.*

Classes of Officers and men.	Peace strength.						War strength.						
	Iron-clads.	Cruizers.	Home and Colonial coast defence ships.	Troop-ships.	Sea-going training ships.	Totals.	Iron-clads.	Cruizers.	Home and Colonial coast defence ships.	Troop-ships.	Mercantile armed cruizers.	Reliefs at home ports.	Grand totals.
Officers R.N. (all branches)	540	1,440	400	200	200	2,780	1,600	1,600	600	200	200	1,300	5,500
Officers R.N.R. and R.N.A.V.	..	..	..	..	..	..	..	..	200 R.N.A.V.	200	600	*ad lib.*	1,000
Petty Officers and A.B's., R.N.	1,320	4,480	1,200	700	500	8,200	3,400	5,400	..	..	..	2,700	11,500
Other seamen and boys, R.N.	1,500	4,800	..	..	1,250	7,550	1,800	4,600	..	..	..	2,100	8,500
Petty Officers and seamen, C.G.	..	..	..	..	..	..	..	..	1,800	..	..	2,200	4,000
Seamen, R.N.R., and gunners, R.N.A.V.	..	..	..	..	..	..	3,000	1,000	1,000 R.N.A.V.	1,200	6,000	8,800	21,000
Stokers, R.N.	600	800	1,200	500	..	3,100	2,400	1,200	1,000	400	..	500	5,500
Stokers from merchant service	..	..	..	..	..	..	..	..	1,000	600	2,000	*ad lib.*	3,600
Artificers and tradesmen, R.N.	480	1,120	400	100	150	2,250	1,600	1,600	600	200	..	500	4,500
Ditto, merchant service	..	..	..	..	..	..	..	..	400	..	300	*ad lib.*	700
Domestics, band, &c.	420	1,120	400	300	150	2,390	1,400	1,400	1,000	600	700	*ad lib.*	5,100
Royal Marine Light Infantry	900	1,920	240	200	250	3,510	4,000	2,800	2,000	600	..	3,600	13,000
Royal Marine Engineers (Torpedo Service)	240	320	160	..	..	720	800	400	400	..	200	1,200	3,000
Totals	6,000	16,000	4,000	2,000	2,500	30,500	20,000	20,000	10,000	4,000	10,000	22,900	86,900

Total number actually employed—from Royal Navy, 43,600; from all Reserves, 20,400.

From these tables we gather that about 15,000 seamen can be employed in both times of peace and war; only that in time of war all the petty officers and able seamen would be sent from troop and coast defence ships to man sea-going men-of-war, and their places would be filled by Coast Guard and reserve seamen.

A proportion of reserve seamen, and an additional number of marines and stokers, would be sent to all ships as soon as possible, thus admitting of the same number of seamen being further divided. In this manner the fleets will be placed on their war footing, and we trust would be found as equal to the duties they would have to perform as our grand fleets of old.

The mention of economy as one of the elements to be secured in our Imperial Naval Force may be very shortly dealt with. It is a truism that first-rate articles are cheapest in the end; let us procure at whatever expense of training the best Officers and men; and if we do not exceed the number required, we shall have acted on the most economic principles. The Turkish Government may congratulate themselves that by the expenses they recently incurred in their iron-clad fleet they have held the Black Sea up to the present time, and this has probably been the turning-point of their war with Russia.[1]

Had Russia been in her former position, and (as at Navarino and Sinope) at the commencement of present hostilities had destroyed the Turkish power at *sea*, she might, after crossing the Danube, have pushed her armies along the coast, receiving all supplies from Sevastopol and Odessa by water, and so have reached Constantinople ere this. Regularity of transport is the *chief* care in moving invading armies, and the sea is the best of all roads.

The value of a naval force is here demonstrated to the fullest extent, for though apparently passive, the mere existence of the Turkish fleet has, without doubt, most materially influenced the tide of war: let this fact weigh with English politicians, as illustrating comparatively the marvellous power of England as a great maritime nation, when her fleets are of sufficient strength to hold all waters against any enemy—

"Arma pacis fulcra."

[1] This Essay was written during 1877.—Ed.